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In This Issue . . .

Facilities For A Large Computer Installation
Robert B. Curry

The Foreman and Productivity
Clem Zinck

Use Of Rate Of Return On Investment
Othel D. Westfall

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Managerial Job Performance Standards

IT IS PRETTY WELL recognized today that people in the management profession are able to work more effectively as individuals, and as organization members, when a clear understanding exists as to job duties and what constitutes satisfactory performance of these duties. The position description is a most useful tool for promoting understanding of job duties and responsibilities. When job duties are spelled out in writing, as a result of discussion between the higher level manager and each subordinate manager reporting to him, confusion and doubt are eliminated in an area where none should be permitted to exist in the first place.

Having reached agreement on job duties and responsibilities, both the higher level manager and his subordinate are next concerned with determining periodically how well these duties are being performed and if improvement in any phase of job performance is indicated. This procedure, like the procedure for establishing the position description, can be carried out most effectively when the two parties directly concerned reach agreement as a result of discussion. This process of performance appraisal, or counselling, is obviously most difficult and usually requires considerable experience in order to produce beneficial results in terms of improvement in the performance of the person whose accomplishments are being appraised. Even the most skillful managers find performance appraisal challenging because of the personal relationships involved and the unpredictability of the outcome. Still, the necessity of effective communication between manager and subordinate on this subject must be recognized.

A comparatively new managerial tool which can be of material benefit in furthering understanding of the often delicate subject of individual job performance is the Managerial Job Performance Standard*. This procedure can best be thought of as a counterpart to the Position Description. The Position Description contains the specific duties of the job. The Managerial Job Performance Standard sets forth *what constitutes satisfactory performance of each duty*. The important thing is to develop terminology which accurately and concisely describes satisfactory performance, as it applies to a given duty.

Like the Position Description, the Managerial Job Performance Standard can be developed best as a result of discussion between a manager and his subordinate. As a matter of fact, herein lies the inherent value in establishing this type of standard. When manager and subordinate agree upon what constitutes satisfactory performance of a particular function, the process of constructive appraisal is tremendously simplified and facilitated. Without the predetermined performance standard, the full burden of bringing to attention areas where improvement is desirable, "criticizing" usually rests upon the superior. With agreed to performance standards, the subordinate is more prone to be conscious of his performance weaknesses and take action on his own to bring about correction. The recognition that a need for improvement exists must take place within the individual being trained before he can be expected to change his actions. Thus, this type of performance standard, when effectively used in a performance appraisal interview, is psychologically sound because it places the burden of recognition of the need for improvement on the subordinate and places the superior in a position where he can effectively help his subordinate bring about improvement in his actions.

It is believed that the study of the use of Managerial Job Performance Standards is a subject which should be of interest to our Chapters in connection with research as well as programming.

H. E. Lunken

S.A.M. National President

* *Much of the pioneering and research in this field has been the accomplishment of our S.A.M Chairman of the Board, John B. Joynt.*

Facilities For A Large Computer Installation

by Robert B. Curry

Comptroller
Southern Railway Company
Washington, D. C.

ALTHOUGH countless words have been spoken and many volumes have been written concerning the ramifications and complexities, the vulgarities and the sophistications of the art of computer operations, there is one area apt to be overlooked or taken for granted. In contrast to the person who built a boat in his basement and then could not get it out the door, or the apartment dweller who bought a horse before he thought of where he could keep it, more than one organization has, literally and figuratively, ordered a computer and then found they had to tear out the side of the building at the fifth floor level in order to get the computer inside. Others have ordered a computer, later finding out they had to pour a new concrete floor at the selected floor level.

While this may seem to be slightly exaggerated, the one area to which scant attention is so frequently given in the original broad contemplation of a computer operation is in the cost and the planning for the actual installation of the computer, and in the construction of the physical facilities for the computer. This housing is something that is frequently presumed. Actually it is anything but an item that just happens of its own accord. Many have been surprised to discover the little problems of doorway requirements to move the equipment in; and more than one has to his dismay recoiled belatedly over complex floor reconstruction problems. Power requirements too are "shocking," as well as the extent and precise requirements for air conditioning. Not much written material is available on the physical plant required for a computer installation. This is in contrast to the reams of paper and hours of conferences that have been scheduled on data processing potentials and computer hardware, applications and programming. Consequently, a review of Southern Railway's study of computer housing and preparation of the physical facilities may be of some interest to other organizations and personnel studying or considering computer possibilities.

ROBERT B. CURRY has served as Comptroller of Southern Railway Company since 1955. From 1948 until 1955 he was Assistant Director of the Johns Hopkins University Applied Physics Laboratory. Mr. Curry organized the Budget Division for the Office of the Secretary of Defense, in 1948, while on leave of absence from his Johns Hopkins assignment. A native of Ohio, Mr. Curry received his AB and LL.B., from Ohio State University, did graduate work at Ohio State and other universities. He is President of the S.A.M Washington Chapter.

INSTALLATION PLANNING

1. Installation Costs

First, taking up the not insignificant cost of the physical facilities for a computer:

Not many organizations will be in the position of General Electric (Evendale) where an entirely new building has been constructed solely for the purpose of housing their several IBM 704 computers and computer personnel; but all other installations will be faced with the problem of large scale alterations and extensive remodeling in existing buildings.

Installation costs of remodeling and alterations are substantial, varying from $100,000 to $200,000 for a large scale Univac or IBM 700 series. One case has been reported where expenses of $220,000 were incurred to prepare the site, move in the equipment and install the heavier electrical wiring required. The Pacific Mutual Life Insurance has reported costs of "closer to $150,000 than to the $85,000 originally estimated to install their Univac." The rather large 705 installation costs at the Social Security Board are reported at $180,000; the U. S. Treasury IBM 705 is estimated at $120,000. Costs for Southern Railway's installation approximated $145,000. Breakdown of these costs is shown in Figure 1. The reason for such an order of magnitude of costs will be

gleaned from an analysis of the requirements which should be carefully reviewed in the pre-installation planning stages.

Even when the dollar cost of alteration is properly considered and evaluated, the work of preinstallation planning is frequently overlooked. Most large computers will require an 18- to 30-month period of waiting between the order and delivery dates. A minimum of six to ten months of this time must be allowed for planning and arranging for the physical facilities and the balance of the time is required for actual construction.

2. Location Planning

One of the first major decisions regarding the physical facilities is to select a suitable location for the computer; geographically, within the company's sphere of operations, within a chosen locality and the particular building and portions of a building best suited for the necessary alterations and rearrangements. (See Figure 1.)

The basis of Sylvania's location of their computer is well-known. Similarly Southern Railway located its computer in Atlanta, Ga., on the basis of the on-line center of operations and location of its largest accounting offices.

Generally speaking, in selecting a location for the computer, a number of factors must be considered in addition to the natural selection of an area in proximity to the work input preparation and output work handling areas. These include consideration of:

(a) The availability of suitable space that can be properly conditioned for housing a computer.

(b) Availability of and location of proper and adequate power source.

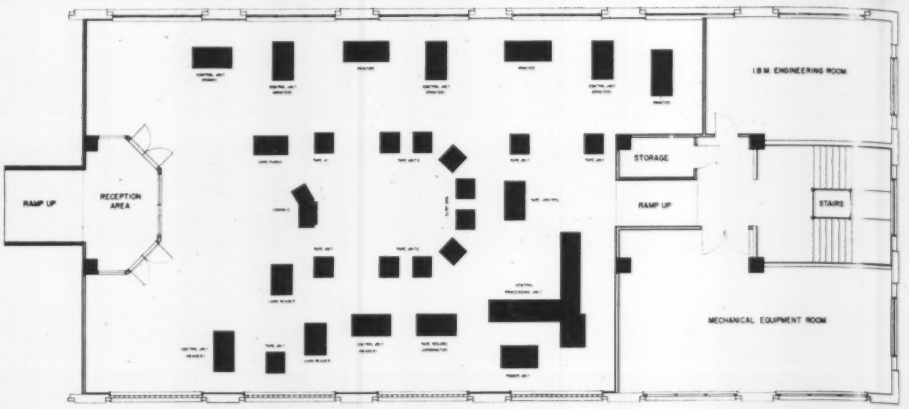
(c) Contiguous space to house air conditioning equipment — the compressor, air handling and duct work and the placement of cooling tower and evaporative condensers.

(d) Sufficient and appropriate space for machine and work areas.

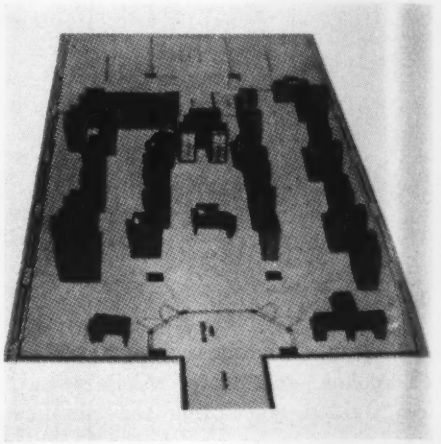
(e) A multiplicity of miscellaneous factors such as minimum outside wall and glass areas, adequate ceiling height to permit a raised false floor (of up to 12 inches).

Space requirements of a large computer are upwards of 4,000 square feet of floor space, the equivalent of a room 40 x 100.

In a general layout, it is believed highly desirable to strive for a high degree of flexibility. Two major installa-



tions in a space of two short years, on substitution of newer, more modern, larger data processing equipment and computer components, have had to abandon the original computer installation site and construct an entirely new installation in a different part of the building. Obviously, such a switch of location is hard to explain, is quite expensive and should be avoided.



GENERAL CHARACTERISTICS

The successful installation of a large data processing system requires long and careful planning and then continuous supervision to see that the plans are adequately developed and properly followed. When an order for an electronic computer is accepted by a manufacturer, the customer assumes the responsibility of providing suitable space for the various components that make up the electronic data processing system. This is a real responsibility and the success of a computer operation starts at this point and rests on how well that responsibility is met. To aid the customer in filling his responsibility, manufacturer's engineers are available for consultation in planning the physical requirements of the installation. Complete and comprehensive installation manuals are usually available. The IBM 705 installation manual is a large detailed publication of 132 pages concerning Preinstallation Planning, Space

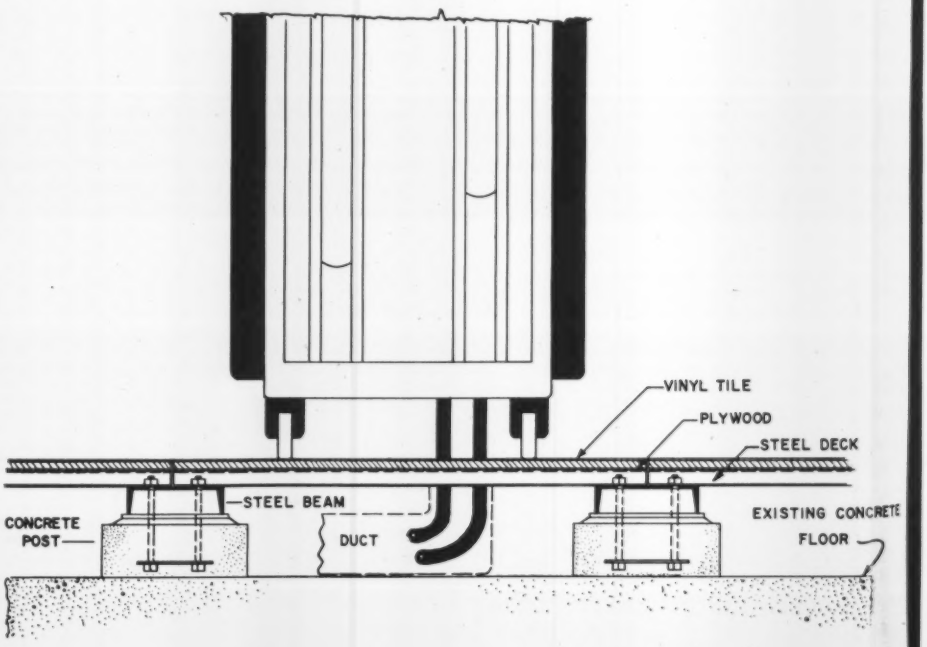


Figure 1

SOUTHERN RAILWAY COST DATA

Alterations and Additions to South Wing, 5th Floor, Freight Office Building Atlanta, Georgia - IBM 705 Installation

Additions

IBM ROOM		
Superstructure:		
Concrete ramps to raised floor, curb walls, floor leg basis & grout	18 CY	$ 506.13
Removable/Sectional (296 panels) hot dip metallic coated floor, plyboard covered on structural steel under frame with lift screws, etc.	3,350 SF	22,508.50
Metal movable partitions incldg. fixed-view windows, doors, etc.	1,505 SF	3,587.44
Suspended ceiling Armstrong Trauer Tone, metal suspension	3,350 SF	7,931.00
Dampproof, fireproof, insulate & soundproof walls	1,700 SF	5,226.00
Acoustical curtains on rods E. & W. walls floor to ceiling	1,500 SF	688.36
Sub total		$40,447.43
Air Conditioning:		
Carrier summer/winter type 50 ton capacity with 2 roof/cooling towers, 2-3000#/25 HP compressors, 303 HP pumps, 1-1/4 HP exhaust fan insulated duct work, grilles, electronic humid stats, colographic recorder, etc.		$45,000.00
1-1/2" steam line ext'n. from power company conn. under Mitchell Street viaduct, thru basement to 5th floor apparatus room 1,000 ft. ea., 350' - 1-1/4" return to cond. meter		3,113.00
Sub total		$48,113.00
Electric Lighting & Power:		
NF DeIon Panel 100A main 14-20A Br. 4 Sp.		
Wiring in concealed metal conduit (Ltg. incldg. 20 switches)	105 Outlets	
Fluorescent Fixtures Holophance recessed 3-40W/9263-4	80 Each	
Fluorescent Fixtures Gibson 2-40W/Ortho 77	5 Each	
Under floor/overceiling power outlets & connections for machines, air conditioning motor, incldg. power breakers, transformers, etc.		$38,784.00
Sub total		$38,784.00
TOTAL IBM ROOM:		$127,344.43
PROGRAMMER'S ROOM		
Air Conditioner:		
Carrier 15 Ton water cooled packaged unit (cooling towers & pumps in common with IBM room/system) Total		$ 6,271.00
Electric Power:		
Connection & controls for air cond. unit		685.40
Total Programmer's Room		$ 6,956.40
TOTAL R&E		$134,300.83

Incidental Operating Expenses

IBM ROOM		
Marble Stools, window sills replacement	$ 1,223.00	
Glass Brick, window replacement	2,664.44	
Thermopane window replacement	1.081.00	
Vinyl Tile, floor covering replacement	2,812.70	
Roof Repair, a/c air cond. cooling towers	291.54	
Demolish, patch	609.50	
Total Expenses		$ 8,682.18
GROSS COST		$142,983.01

and Layout Requirements, Building Requirements, EDPM Power Service Requirements, Air Conditioning, Cables, Area Cleanliness, Tape Storage, and Typical EDPM Test, Office and Laboratory Equipment.

Frequently, customers have established preinstallation consulting and service groups or organizational committees. These may include manufacturer's representatives, and sometimes personnel from outside accounting firms or engineering consultants, as well as other outside methods engineers or business management consultants, in addition to the organization's own staff. Such a group will consult with and advise the customer's EDPM personnel on the course of action, objectives and progress of the installation. The customer, of course, is in charge of the over-all operation and will integrate the preinstallation planning with his general planning and procedures.

By the time the actual order for the computer is closed, or becomes firm, a great deal of the preliminary methods and procedures planning will have been completed because such planning must form the basis for the detailed machine order. The customer's planning and programming staff will have listed the actual components to be used in the installation. This list should consider not only data processing components, but other furniture, equipment, etc., including the tape storage cabinets, work tables, chairs and desks. In some customer's offices facilities generally suitable for installation will already exist. However, in the majority, either minor or major alterations to existing space will be required to provide a suitable location. In some instances, a complete new building will be desired by the customer. In all cases the operation should follow a planned schedule so that the machine room will be ready to receive the data processing equipment as it is delivered.

SCHEDULING OF CONSTRUCTION

Because each computer installation will differ in some respects from every other, generalizations are difficult on such vast and divergent conditions that will exist between computer installations, and it is not possible to establish a detailed schedule to fit all situations. On the other hand, a suggested schedule will provide a general background for scheduling the installation. Some 12 months before machine delivery, determination should be made of the data processing system components and the prospective location should be studied. A preliminary layout of the proposed installation using templates scaled to 1/4 or 3/8 inch to the foot should be prepared by the members of the customer's planning and procedures staff with the assistance of IBM customer salesman and engineering personnel.

The local delivery quotations on power and air conditioning equipment should be investigated and the lead time on ordering and the procurement of such equipment should be determined. Six months before the data processing system delivery, the location of the central processing unit and the console should be determined with precision and at least some finality so that console cables may be measured and ordered. Air conditioning equipment orders should be reviewed at this time to determine that delivery and installation will proceed as scheduled. Four months before machine delivery the final layout for all of the computer components should be made and approved by the customer and the manufacturer's engineering staff so that all cables can be ordered. This is the critical point in the schedule—the point of no return as to further changes in machine layout. After the cables are ordered by the manufacturer's engineer, changes that will affect cable lengths should not be made in the layout. One month before delivery a survey will be made by the manufacturer's representative to determine the specific requirements for moving the machine components from the delivery platform to the machine room. However, the actual arrangements usually must be made by the customer and at the customer's own expense. Pertinent information should be reported to the manufacturer's traffic personnel. Two weeks before machine delivery the cables will be delivered to the machine room for installation under the supervision of the manufacturer's engineers. Prior to one week before machine delivery all air conditioning equipment should be installed, tested and ready for operation. Electrical facilities, lighting, floor ramps, window pane, plastering and decorating work should all have been accomplished prior to this time. All efforts should have been made to balance the air conditioning system as soon as possible after the machine has been delivered. In Southern's case, the air conditioning equipment was operating continuously the two weeks prior to receipt of the computer components.

The above represents minimum requirements. A suitable time factor and safety factor should be incorporated in all planning so that the area will be ready ahead of time. Data processing computers cannot be delivered to an unfinished area. Manufacturers will not even ship their computer equipment unless the customer's area has been completely finished by delivery shipment date.

SPACE PLANNING

Naturally, space and layout requirements will differ for each data processing installation. However, large computer installations will require between 2,000 and 4,000 square feet of floor space depending upon specific components employed. In addition, space must be provided for a magnetic tape storage area, a work area for card files, tables, desks, possibly EAM equipment such as punches and sorters and a room for the computer service engineers. Contiguous space must be provided for air conditioning and generator equipment. Bulk storage area of something on the order of 100 square feet is advisable for filters, equipment transformers and other miscellaneous items which must be accommodated.

The achieving of a good workable layout requires extensive study of particular problems attendant upon space being converted and problems inherent in the individual situation. Innumerable model layouts should be prepared to experiment with various arrangements of the components. It is strongly recommended that scale models (1/4 inch, 3/8 or even 3/4 inch scale to the foot) of components be constructed to realistically portray the layout. One-tenth scale models of both IBM and Remington Rand computers are available from Lester Associates Inc. and others, but will run from $1,500 to $5,000 depending upon the scope of the model layout.

In any event some kind of templates is a necessity and many tentative layouts should be proposed, reviewed and discarded before optimum conditions are achieved. It cannot be too strongly emphasized that considerable attention must be given to operational needs and technical requirements of cable lengths, work clearances, walkways, etc., in order to achieve desired flexibility as to component placement for the particular space provided and the specific machines contemplated.

A number of general layout suggestions are offered:

(1) The front of the tape units operating off of the main frame, placed with their signal light indicators visible to the console operator, is highly desirable.

(2) The card reader should be located close to and be visible to the console operator.

(3) With respect to the auxiliary operations, the front of the tape units should be visible from the respective printer, punch or reader with which the tape unit is being used.

(4) Whenever possible, the front of the control unit should face the units they control. For example, the buttons and the lights in the printer control unit should be visible from the printer, and vice versa.

(5) The tape units which may be operated selectively, as part of the main frame operation or as an auxiliary operation should be located at the end of the line of tape units.

(6) Adequate working areas are required around the tape units and other components as well as in the console area

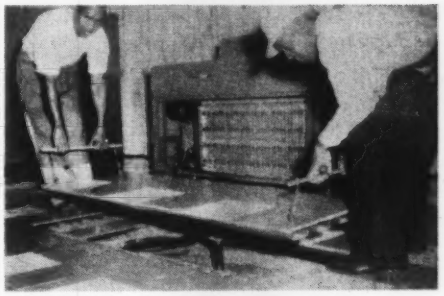
(7) The machine area should be planned so that expansion is possible. It should be possible to introduce new machines, additional equipment or substitution of equipment without requiring a complete revision of the layout.

(8) A magnetic drum, if used, does not require frequent attention from the console operator and it, therefore, can be placed at any convenient location provided cable length requirements and work clearances are observed.

(9) Similarly, the main frame (CPU—Central Processing Unit—or ALU—Arithmetic and Logic Unit—as the IBM 705 main frame is termed) does not require attention of the operator and need not be located near the console. However, manufacturer's representatives for the convenience of their maintenance engineering diagnostic checkout will recommend, and from their standpoint it is highly desirable, that the main frame be located where the console lights can be observed while working on the main frame.

(10) From their standpoint the air conditioning engineers will want the main frame (CPU) to be as close to the air conditioning units, condensers and generators as possible in order to minimize the otherwise extended air condition ducts.

Obviously, all of the foregoing conditions cannot be satisfied in any layout. In the first place, in regard to the IBM



705 installation, the very limited cable length between the units, something on the order of 25 feet for each line of five tape units and an over-all 150-foot cable length for the entire system, requires a compactness which is difficult to achieve under ideal conditions. Pillars and posts, walls and other structural elements invariably exist and constitute impediments, the effects of which must be carefully considered. Cable lengths are almost always a limiting factor. Since all the desirable conditions can never be met, acceptable and workable compromises necessarily have to be made.

In summarizing this aspect of the physical facilities for a computer, it is strongly urged that this phase of planning not be rushed and that what others have done and are doing in this respect should be carefully examined.

A 3/8 inch to the foot scale model of Southern's IBM 705 layout is shown in Figure 2 and gives an impression of the relative placement and respective sizes of components.

REQUIREMENTS

A number of general references have been made to building requirements and the items which must be faced in the preparation for a computer should be enumerated:

Floor—a raised floor with underfloor ducts for cables and wiring, and in some instances air conditioning
Power Supply—separate supply and transformers
Air Conditioning—
System design
Temperature control
Humidity control
Dust control
Housekeeping provisions
Other items—
Lighting and light control
Moisture and condensation
Fire protection
Acoustical treatment—soundproofing

1. Floor

A major construction item in remodeling space to provide adequate physical facilities for IBM and some other large computers is the false floor which is required to provide space for cable and wiring connections.

Two basic types of EDPM raised floors are known as "raceway" floors and "free" floors. A raceway floor has troughs or cable channels approximately 12" wide and 5" to 12" deep, built into the floor to carry the interconnecting cables. These raceways should be topped with removable panels.

A free floor is designed so that cables may run in any direction under the raised machine floor without being restricted to a definite path. This type of floor allows extreme flexibility so that

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components can be relocated in the area with a minimum of construction work since raceways will not have to be moved or rebuilt.

In either type of raised floor, cables will be protected from injury, scuffing, dampness and flexing (in this connection there are very rigid restrictions on a turning radius). The cables are supplied by the manufacturer and are custom-made, based upon lengths required. Under no circumstances may these cables exceed maximum lengths prescribed for electronic safety.

Floors may be constructed of concrete, steel or aluminum depending upon local building code and fire insurance requirements as well as budget limitations, and building restrictions must be fully considered. Machine weight distribution is also a problem with some computers.

SOUTHERN's plans were to achieve maximum flexibility by a pedestal supported floor with Robertson Steel Deck Panels, covered by 3/8" plywood and 1/8" vinyl tile floor covering. The panels are 2 feet by 6 feet removable for easy access to underfloor areas. The flooring rests on steel beams running across the width of the building and is supported by concrete pedestals providing a 5" clearance for the entire floor except for the 4 inch by 4 inch pedestals. This type of free floor has been designed so that the communicating cables and electrical power supply may be run in any direction under the raised machine floor and not be restricted to a definite path. The type of floor allows complete flexibility so that components can be relocated in the area with a minimum of construction work since raceways will not have to be moved or rebuilt. The only requirement will be the cutting of new holes in the steel deck panels to accommodate any newly changed machine's layout. Cutaway drawing of the floor construction is shown in Figure 3 and a schematic of the floor plan layout of components in Figure 4. Other attributes of floor construction are illustrated in Figures 5 and 6.

2. Power Requirements

Power requirements are exacting and specialized.

A data processing system usually requires a 208 volt, 3 phase, 60 cycle power supply. Generally speaking, a separate transformer connected to the highest primary voltage source should be used to furnish power. Types of transformers, motor generators, low voltage networks and power receptacles of necessity are determined by the type of system being installed. Detailed power information must be obtained from the manufacturer. Similarly, separate transformers for air conditioning and for the computer equipment appear advisable.

3. Air Conditioning

The most rigid of air conditioning requirements are involved not only for maximum operation, but for any operation at all. It is important that the cooling cycle be a year round factor due to the amount of heat dissipated by the machine operation some of the computer components are veritable furnaces really capable of heating a house. This fact requires special air conditioning equipment even though the building itself may already be air conditioned.

The conditioned air may be supplied from unit air conditioners located in the machine area or from a remote air conditioning plant via overhead or underfloor ducts. Multiple unit systems have been widely used, but are certainly less preferable, although cheaper than a central system.

REGARDLESS of the type of duct system, recirculated air should be used in the maximum providing only a minimum of fresh air introduction to avoid dust. Total quantity of air conditioning capacity required must be determined by calculating machine heat dissipation, number of personnel employed in the room, latent load, fresh air introduction, infiltration of heat through outer walls, ceiling, floors, door openings, windows and so forth. Careful attention should be given to eliminating excessive drafts in the cooling system, which can create very objectionable working conditions. Suitable ducts and diffusers are necessary to overcome this problem. Southern has installed 50 tons of air conditioning; usually 40 ton capacity is minimum.

Temperature Control—The maximum operating temperature limitation is 80° F and machines actually shut off at 80°; minimum 72° F and the recommended designed temperature of the conditioned space is 75°. Safety pilot light warning systems are considered a necessity to insure that maximums are not exceeded in temperature and humidity. Recording devices are required to show temperature fluctuation round-the-clock 24 hours a day, 7 days a week.

Humidity Control — The air in the machine room should have a relative humidity of not less than 40% and not greater than 60%. Air temperatures should be kept above the dew point to prevent condensation within the machines. Safety instruments, including a pilot light warning system, must be provided to insure that humidity limits are not exceeded. This is particularly true for after hours and week end recording of temperature and relative humidity.

Dust Control—A filter bank with an efficiency rating of at least 90% extraction by particle count down to one micron in size is required in the fresh air intake and in the recirculated air system. Southern's installation is controlled with electrostatic dry charge type filters with a resistance check. Extreme care must be taken with respect to dust. Dust on magnetic tape and on the inner part of machines can cause serious problems, and dust on magnetic tapes has been the cause of more errors than all other factors combined.

Temperature, humidity and dust control are important and carefully con-

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trolled attributes of the air conditioning system.

Most mistakes made in preparing the physical facilities for a computer have been made in air conditioning.

4. Miscellaneous

Acoustical Treatment—Special acoustical treatment to cut down on machine noises is recommended. The ceiling is the most important point, since air exhausts from the top of the units carry mechanical noises upward. Also, special acoustical treatment or at least acoustical drapery material should be used on the walls.

Lighting—Draperies or curtains are also required to control outside light as direct sunlight is to be avoided. In providing lighting, a minimum average illumination of 40 foot-candles, measured 30 inches above the floor should be maintained in the general machine room area which is adequate to observe various console and signal lamps. Lighting in the work area, tape area and engineering area may be designed to step up the lighting to 60 foot candles, if desired.

Moisture Barrier—In localities where outside temperatures fall below freezing, double glazing of window panes is necessary to prevent condensation. If outside temperatures fall considerably below freezing, the exterior walls of the building must be waterproofed on the inside to prevent structural damage.

Fire Protection Equipment — Carbon dioxide fire extinguishers should be provided as per local code and fire insurance regulations. Water extinguishers should be avoided, for if used, would cause extensive damage to the machines.

AUXILIARY SPACE REQUIREMENTS

1. Tape Storage

Tape storage both for short-range and long-range requirements must be considered.

For *short-term storage* — In the tape storage area too the atmosphere must be controlled within the following limits:

(a) relative humidity 40-60%

(b) temperature 65-80° Fahrenheit

If the tape is removed from the short-term storage area, and not hermetically sealed in a plastic bag, then it will have to be conditioned for a possible twenty-four hours in the controlled air conditioned area to prevent harm to the data on the tape.

Long-term storage — (a) the reels should have proper mechanical support; (b) the reel and container should be enclosed in a hermetically sealed moisture-proof bag; (c) Temperature of area may range between 40° and 120° F; (d) Obviously, tape should not be in contact with magnetic materials at any time and should never be subjected to strong magnetic fields. These conditions can also cause loss of information from the tape.

2. Other Space Requirements include

(a) Manufacturer's representatives or service personnel test and repair area

(b) Mechanical space—obviously the amount of equipment we are talking about requires a considerable amount of space

(c) Other, including visitor viewing and reception area

HOUSEKEEPING

Housekeeping problems included in the cleaning of the area are:

Ceiling and wall finishes must be such as not to flake, dust or chip. This is quite important in keeping the area dust free.

Floor covering materials — Asphalt tile has a tendency to crack near the edges of floor panel covers. Vinyl or rubber tile is recommended.

Carpeting may be used provided it is made of lint and static free material. This also applies to draperies used for light control and for sound-proofing and acoustical purposes.

Waxing should be kept to a minimum and a non-flaking wax must be used.

Smoking should not be permitted in the vicinity of tapes. Smoke dust and ashes on tapes are frequent causes of errors. Materials should not be placed on machine tops where they may tend to restrict air flow or cause chance items to fall into the machine.

Complete cleaning of underfloor area, including ducts, must be done before machine installation and at periodic intervals after installation.

Entire installation area should be cleaned at least once a day.

Cleaning should be done with a damp mop, never dry or wet; under no circumstances can sweeping be tolerated. Vacuuming may be done if connected to external vacuum or an adequately sealed water container. A non-conductive type vacuum nozzle must be used.

SUMMARY

In summarizing requirements for the physical facilities for a computer, one thing that should be noted in passing, however, is the certainty of change. After Southern started planning its construction, three new components were announced by the manufacturer and ordered by Southern to augment its 705 system. These were

High Speed Printers
TRC (Tape Record Coordinator)
TDS (Tape Data Selector)

These all required changes in the layout and planning in general.

In addition, developments in the future will require new and extensive change. With increased use of transistors for example, savings of up to 50% in space are predicted and air conditioning and power demands are claimed to be only 10% of present requirements. There are other changes in the office that are certain to be as dramatic. To answer the obvious question, Southern had to go right ahead with presently available equipment. But the physical facilities area is a dynamic situation which promises not to become static in the foreseeable future. Consequently, Southern has built into the physical plant as much flexibility as possible. This has increased the cost, but will undoubtedly provide substantial savings in the long run.

In accordance with the definition of a computer expert—one whose computer has not yet been delivered—Southern can no longer qualify, but since we have built the facilities to house a computer, we are glad to advise others regarding some of the trials and tribulations therein, based on actual experience. ■

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YALE University Press, New Haven, Conn.

The Foreman And Productivity

by Clem Zinck

Plant Manager
Arbogast & Bastian Inc.,
Allentown, Pa.

FOREMEN are important. In production, in human relations, in quality and in costs they are indispensable—the front-line soldiers for management in the constant battle to meet the customers' demands for a better product at a lower cost.

Foremen can also be important in the company-wide Method Improvement activity. Each foreman is in a unique position to assist those who have the direct responsibility to increase productivity, as well as to do Method Improvement work himself.

Does the foreman recognize and accept that he has a part to play in Method Improvement?

To find out what the foreman thinks his responsibilities are and the time he takes to carry them out, a survey was made by the Radio Corporation of America.[1] The survey is good, authentic, factual because RCA had the wisdom to ask the foremen themselves to tell what they did each day and how much time was taken up by each activity. The RCA foremen listed these *Big Five* activities that take 78% of each day's time: *Production Schedules, Human Relations, Quality Control, Costs, Methods*-8% — Twelve years later a Technology Project of Yale University confirmed the RCA survey.[2] The Yale Project was an on-the-job observation of the activities of 56 production foremen.

Foremen of any well-managed manufacturing plant will list the same Big Five activities as his major workday load. He *knows* that he is *expected* to "make improvements." Management has, therefore, the opportunity and the responsibility to see to it that those minutes per day and hours per week expected to be given to methods *are given and are productive*—that they definitely do contribute to increased productivity.

Management will be able to utilize the unique position of the foreman to increase productivity when the foreman has been trained to be as *methods conscious* as he is conscious of production schedules, human relations, quality, and costs. When the foreman checks a work area to keep production on schedule, to develop better human relations, to improve quality, to lower costs, he should also check the method. He should conscientiously think, "How can this job be done quicker and/or easier?" "How can I assist the full-time methods men?"

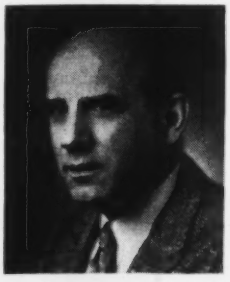
The Methods Team

Every progressive manufacturing firm has a well-developed, company-wide, method, improvement program. It is staffed with full-time methods men who have the direct responsibility to increase productivity. For the purpose of showing how the foreman can be trained to assist them, it can be said that their duties, responsibilities and activities cover these four functions.

PRODUCT DESIGN—This is the function of improving the present products to meet the constant customer demand for a better product at a lower cost, and even more important, designing new products to fill new wants of the customer. This function through product research, development, design and engineering tells the factory what to make

[1] *Reported in July* 1944 *issue of PERSONNEL, published by the American Management Association.*

[2] *Reported in May* 1956 *issue of PERSONNEL.*



W. CLEMENTS ZINCK received the wide and varied experience that fitted him for his current position through jobs with the Canadian National Railways, Dictograph Products, Inc., North and Judd Manufacturing Company, Talon, Inc., U. S. Cast Iron Pipe and Foundry Co., and the U. S. Printing and Lithographing Company. The jobs he held include clerk, tracer, draftsman, designer, plant engineer, time study engineer, industrial engineer, assistant general superintendent, manager and production manager of branch plants, purchasing manager, assistant to V. P. of Manufacturing, factory manager, general manager, and consultant. He is a Registered Professional Engineer in the state of Ohio, a Past President and Past National Director of S.A.M. Lehigh Valley Chapter and a member of AMA.

through drawings, and sets the quality standards thru specifications. Product design is the foundation of the future of the company. If the company cannot keep at least abreast of its competition in the vital race for customer acceptance, the company will be forced out of business eventually on product design alone.

PRODUCTION ENGINEERING—This is the function that tells the factory how to make the product with the buildings, equipment, machines and skills available, and if necessary, specifies what new buildings, equipment, machines, and skills must be provided in order to produce basically new product. It must "iron out the bugs" between product engineering and factory production. Production Engineering is vital: The total cost of production can never be lower than those that can be obtained by the methods specified; the quality can never be higher than that which is built into the product by the facilities, processes, procedures, methods, operations used. It is good production engineering that tools up, makes, and ships a high quality, low cost product with the minimum of lost motion — something that does not just happen.

MACHINE AND TOOL DESIGN—This is the function that recommends the purchases of additional standard machines needed to make the product, or designs the special machines called for by the processes and procedures specified by production engineering and designs the tools, jigs, fixtures and apparatus that hold the material so that the cutting element of the machine can do its work, or the hand work can be done efficiently. When the machine and tool designers have finished their job *the costs of production have been fiexd*—only refinements can be made after that. This stark reality is the reason why in many progressive companies no machine or tool gets by the sketch stage until a *work analysis* has been made to show the method and the resultant labor cost that must result from its use. Only those designs that show the lowest total costs are developed into actual machines and tools.

INDUSTRIAL ENGINEERING — This is the function that correlates the activities of the worker with the materials, machines and tools to make the product. It is the function that works between and with product engineering, production engineering, and factory production to develop the refinements which will allow the product to be made with the minimum of waste and the lowest labor cost using the facilities provided. The most important stock-in-trade of the industrial engineer is his overall broad knowledge of "known faster devices", the proven ways and means to produce better and quicker—and a major part of his job is to see that none are overlooked by any member of the company-wide methods team, including himself.

IT CAN now be asked, "If an alert management provides a company-wide methods team from product design through to the methods the worker is to use, why make the foreman a part of the methods team?" "Why not let him concentrate on those parts of his job that he alone is in the position to do?" There are important answers to that logical question. First, present-day competition is so intense that an alert management will take and profit from the help that foremen trained in method improvement can give. Second, an alert management knows and fears at all times that as good as its methods team may be, its competitors may have a better one. The extra help of its trained foremen may well be the edge that keeps the company ahead of its competition. Third, an alert management knows that it will get better all-around foremanship when it uses its foremen to their full capacity and capabilities and thereby satisfies their desire to belong, to participate, to accomplish. The capable foreman wants to make a good product. He also wants to help make a better and better product that can be sold at a lower and lower price.

Thus, the alert management of a progressive company has long since learned to train its production foreman to back up its company-wide method improvement team. Only when this is done, has management done all it can do to lead the field in product design, quality, and delivered price.

How Improvements Are Made

If it is agreed that there in need for the foreman on the company-wide methods team, what are the answers to these questions: "Does the foreman's experience and the area and scope of his day-to-day activities give him opportunities to see method improvement opportunities?" "Is he in a position where his interest and desire to be a part of the methods team can be put to use effectively?" "Just how is a new idea born?" The basic sources of methods improvements are the answers.

EXPERIENCE—When it is realized that what needs to be done can be done by an adaption of what was successful on some other activity, the improvement idea has not only been born, it is developed up to the point of adapting it to the new situation. The experience of a foreman and of his employees is a vast storeroom of proven methods. The experience of the group of men in a department will cover a range of industries worked in, functions performed, and jobs worked on that will thrill the imagination! Just think what improvements could be made on any factory problem if the combined experiences of all the foremen and employees were guided and concentrated on that problem. Management can tap the experience of its foremen.

INGENUITY—Ingenuity can open up great possibilities. Often the results of a new twist are startling. Production foremen are usually not ingenious to a marked degree—those employees who show a marked degree of ingenuity usually advance in a company via machine and tool design and production engineering where direct use of their special abilities can be made. However, all production foremen are ingenious to a degree, and management can guide foremen to use an open-mindedness to tackle old problems with a fresh outlook, or as one clinic enrollee said, "What you mean, Mr. Zinck, is to lay the problem down, 'spit on your hands,' and take a fresh hold." Foremen will respond—every plant has its miniature Edisons and Ketterings, and not every Rube Goldberg is without a possible application.

HAPHAZARD OCCURRENCE — Haphazard Occurrence, or just plain, simple Luck is a source of method improvement. What school child has not been told of the accidental discovery of how to vulcanize rubber? Dr. Paul R. Heyel, late of the United States Bureau of Standards (the man who weighed the earth!) said in a lecture on electronics that the electronic microscope was developed from the observance of an unusual phenomenon during an entirely unrelated experiment in a G. E. laboratory. He went on to say that the basic philosophy of the General Electric research activities is to have highly trained, skillful men around who can detect when something unusual is occurring, and then find out something about it before it disappears, perhaps forever.

In fact, the electronic microscope

seems to have all the luck! A rubber company produced one batch of synthetic rubber that through some fluke had separate particles uniform in diameter and 1/100,000th of an inch in size. Haphazard occurrence also provided the electronic microscope with its perfect measuring stick!

MANAGEMENT can create the plant atmosphere that causes the foremen to "keep their eyes open" and to report what they "see" because their reports will get careful, considerate attention.

RESEARCH — Experience, ingenuity, luck; they will continue to play their part in method improvement. They caused *all* method improvement until recently. The story of improvements in the past is the combined stories of Edison, of Westinghouse, of Steinmetz, of Marconi and those other stalwarts of the past whose untiring efforts and constant search for better ways of doing things laid the solid foundation for our present manufacturing development. And those who follow in their footsteps today are adding individual contributions equally as helpful. However, since the impetus given it in World War I, and the violent surge of World War II, there has been developed a technique that is responsible for the major part of present-day method improvement, and will be responsible for an ever and ever larger part in the future. That technique is *research*. Hardly a day passes now without an announcement of some new product, drug, or technique developed through research. The research budgets of manufacturers and the government run into billions of dollars per year.

It is a remarkable fact that the research technique is a technique that can be used by the foreman for the same purpose, method improvement. That fact provides the basis for alert management to train foremen in method improvement.

Purposeful Thought

Research is *Purposeful Thought*. It is thinking through a problem on an organized basis for a purpose. That technique makes method improvement at the foreman level possible. All than an alert management has to do get its foremen on the methods team is to train them in the simple techniques and then inspire them to give Purposeful Thought to one work after another in a continuing search for ways and means to do a job easier and/or better—to work smarter, not harder. True, as has been stated, the foreman has his production schedules, his human relations, his quality, his cost problems to work at—and those problems are insistent! But an alert, well-rounded, trained foreman knows too that the competitive need for improved methods is equally insistent. He knows he should give Purposeful Thought to the method at each work area and the general activities in his department.

Purposeful Thought by a foreman when it is expected of him and its results given quick, considerate attention, will uncover a constant flow of opportunities to investigate for method improvement.

Here is an example of Purposeful Thought. "George was the foreman of a department where electrostatic condensers were made. In connection with a course in Method Improvement, George was asked to observe the present method of doing some job to see if he could find an opportunity for improvement. He chose the soldering operation of a rectangular condenser.

"Here was the operation as he found it: The top was soldered in place after the condenser can was filled. The condenser was held in a rectangular wooden holding block 3 x 3⅝ x 1⅜ thick. The block was held in the left hand and the soldering wire in the right hand. The soldering iron was held rigid in front of the operator in a slanted position, which enabled the condenser and the solder to be positioned easily against the hot iron. One side of the condenser was soldered. The block was then given a quarter turn, and the second side was soldered—and so on for the four sides.

"George studied the operation. He noticed a hesitation in the soldering each time the right hand helped the left hand to give the holding block the quarter turn because it was rectangular in shape and awkward to handle. George had a round block made, 3⅛ diameter x 1⅞ thick. It was small enough to fit the left hand snugly. As a result, the quarter turn could be made by the left hand without assistance from the right, so that the soldering was practically continuous. Production increased 14 per cent."

Don't blame the blockmaker too much. Who doubts that ninety-nine times out of a hundred a rectangular holding block will be made for a rectangular condenser? It was not until Purposeful Thought was given to what the holding block was to be used for, and why, that the opportunity to eliminate the hesitation was seen.

George demonstrated to himself that when a job is observed to learn exactly how it is done, and *Purposeful Thought* is given to the method used, opportunities to reduce waste or improve the method will be seen.

The Written Record

It can be demonstrated without fear of failure that when a group of foremen is shown a movie of a present method of doing a job and asked for suggestions for improvement opportunities, many opportunities are suggested. It was from this phenomenon that Allan Mogensen developed Work Simplification. Beyond question, the effectiveness of Purposeful Thought can be proven at any time on any situation. The question now to be answered is this: "How can the foreman apply Purposeful Thought to his method improvement activity?"

Obviously, it is impractical to make a movie of each situation to be studied for method improvement ideas. Equally as obvious is to think that method improvement opportunities will always come to mind when a foreman just stops and looks at a situation, regardless of its simplicity or its complexity. It takes years for even the best of full-time methods men to train themselves to be able to see improvement ideas by just looking over a situation. What, then, is the help that has to be given the foreman to assist him in giving Purposeful Thought to a situation? Is there a simple research tool that he can use effectively? Is there something as effective as a movie, something that can be used on every activity?

Fortunately, there is a proven technique always available to the foreman who wishes to give Purposeful Thought to any activity under his supervision. It is the *written record* of the activity as he actually saw it done. The simple rule for making a *written record* for method improvement use was given years ago by Rudyard Kipling:

"I keep six honest serving men.
(They taught me all I knew.)
Their names are WHAT and WHY and WHEN
and HOW and WHERE and WHO."

The complete facts of any operation, any man-machine combination, or any process, will be recorded if the foreman, through actual on-the-spot observation, will find out and write down the what, where, when, who, how, and why of what he saw done. Kipling's helpers will ferret out for him *all* that can possibly be known.

Furthermore, and this is what can make the foreman a valued member of the company-wide improvement team,

when a foreman places on record all the details, all the facts of the present method of doing a job, he will discover for himself this simple, powerful fact: "*The mere act of recording on paper the What, Where, When, Who, How, and Why of any work will, of itself, generate ideas of how the work can be done in an improved manner.*" I have yet to know of any man who made the complete record of any activity who did not see opportunities to be investigated to improve it.

HERE is the story of Joe Vanet, foreman, and his first *Written Record*. It is a record of his best diesetter setting up a foot press to stake the staff of a volume control:

10' *Walks to Parts Storage rack.*
Picks up parts.
10' *Walks back to press.*
Places parts on press bench.
18' *Walks to die cabinet for staking die.*
Locates and picks up die.
18' *Walks back to press.*
Places die on bench.
60' *Walks to next production line for wrench.*
Gets wrench.
60' *Walks back to press.*
Places wrench on bench.
18' *Walks to die cabinet for washers.*
Picks out washers from box
18' *Walks back to press.*
Places washers on bench; sets up die; stakes trial staff.
36' *Walks to blueprint file for print on new job.*
Picks out new print.
36' *Walks back to press.*
Places print on bench; checks staff against print; tightens nuts to secure die in press; picks up old die.
18' *Walks back to die cabinet.*
Places old die in proper location.
18' *Walks back to press.*
Picks up wrench.
60' *Walks to next production line to return wrench.*
Returns wrench.
60' *Walks back to press.*
Picks up old print.
36' *Walks to blueprint file.*
Places old print in file.
36' *Walks back to press.*

Instructs operator on how to properly perform the operation.

What was Joe's reaction when for the first time he saw in full detail what his best diesetter did in setting up a job? Joe said. "I got sick and tired just watching the fool walk around." Having seen what was *actually* done, what opportunities to improve the situation came to Joe's mind? What did Joe do? He saw to it that his best diesetter kept his tool kit complete at all times, kept a full assortment of nuts, bolts, washers, clamps, and "used his head to save his feet"; that is, took the old die and old print back when he got the new die and the new print.

What makes the Written Record so effective? What is shown up so clearly? What facts does the Written Record bring to the *conscious attention* of the observer, for the things seen had been done before his very eyes all along? What stirs him to activity to eliminate or reduce them? To answer these questions is to supply the reason why an alert management will train its foremen to apply the research technique on his job, to give *Purposeful Thought* to each activity in turn, to use the *Written Record* to obtain opportunities to investigate and to improve any activity.

The Written Record that answers the what, where, when, who, how and why, must by its nature be a record of details, and four types of *Waste* are constantly occurring in any activity of an operator, or in any work done on material. They occur when a man uses his hands; they occur when a man uses a machine; they occur in the use a man makes of his time; they occur when material is processed, operation by operation, part by part, to the completed product. These WASTES are: Transportation, Delay-Storage-Idle, Inspection, and Failure To Use Known Faster Devices.

TRANSPORTATION is seen for what it is, a waste of time and effort that adds nothing to the material but cost, or a waste of time for the man to get from one work area to another, or a waste of time to get the hands in position to use the most marvelous tools in the world—hands.

DELAY-STORAGE-IDLE is seen for what it is, a waste; a thief of time that increases the elapsed manufacturing time on the parts, sub-assemblies, and assemblies, and thereby causes an increased overhead cost to provide space, heat and light; a thief of time that increases the labor cost to move, store, record, and move again the work-in-process; a thief that increases the money tied up in inventory and the interest on that money; a thief that increases the time the man is on a job and thus increases the direct labor cost.

INSPECTION is seen for what it is, a waste of labor, a constant reminder that as yet it is not known how to do the job without stopping every now and then to do the waste work to see if what has been done is satisfactory; a constant reminder that more quality has yet to be built into the product.

FAILURE TO USE KNOWN FASTER DEVICES is seen for what it is, a waste of time and effort because with the known better method and tool, the same effort would get the job done in less time.

Therein lies the effectiveness of the Written Record. Each of these four *wastes* is caused to stand alone to be seen for what it is—a plain and simple hindrance to the foreman's basic job of getting out production. When the foreman clearly recognizes these wastes, these plain and simple hindrances to his main job, he gets ideas as to what can be done to eliminate or reduce them, and then, the man of action that he is, gets things done or does himself those things that will eliminate or reduce them —just as George had the round holding block made, and Joe told his best diesetter to keep his tool kit complete and to use his head.

The Written Record is effective because it makes the foreman realize that: *Any work that does not add value to material, does not plan or calculate, does not give or receive essential information, is REDUCIBLE WASTE.*

The foreman becomes conscious of the reducible wastes in all work because he has to note them as separate elements as he makes the Written Record—*writing about them makes them stand apart from the elements of work that got something done.*

The foreman's actions when he becomes conscious of waste demonstrates the fundamental fact of waste reduction or method improvement. Once he recognizes a waste, his thinking jumps from becoming conscious of a waste to ways and means to eliminate that waste. He proves this fundamental fact, terrific in its impact on lowering *costs by increasing productivity: Once a person becomes really conscious of a waste and has the desire to make improvements, ideas to eliminate the waste come to mind.*

The Foreman and Method Improvement

How can the unique position of the foreman in production be utilized for Method Improvement? What use con be made of a foreman who is in daily contact with the major wastes in all work? Where do his activities fit into those of the company-wide methods improvement team? What can an alert management look for in return for training a foreman in Method Improvement on the production floor?

The trained foreman can play an effective part in Method Improvement in three ways:

1) as a kibitzer 2) as a cooperative helper 3) by his own method improvements.

THE production foreman is not a natural as a methods man; if he were his natural talents would have won him assignments and promotions in engineering. But he is a natural kibitzer, and is in the perfect position to kibitz. He, and he alone, has the responsibility to keep production on schedule. His job forces him to get at least a temporary solution to overcome every "bug" in the product, or the method, or the machine, or the tool that is holding up production. He may not know how to fix it, but he knows what must be fixed if production is to be smooth and costs at a minimum. He can get word of trouble to the full-time methods man concerned, who always welcomes a foreman telling him immediately when something has gone wrong. Countless hours of limping production can be reduced, and the desired quality standards can be met countless hours sooner when the foreman is alert and has the desire to get help promptly when he has that first inkling of trouble, when quantity and quality are not being obtained as quickly as expected.

The foreman is the indispensable man to the full-time methods man—the work must be made by employees under the direction and influence of a foreman. True enough, the foreman is told what to do by the schedulers, he is told when to do it by the dispatchers, and he is told how to do it in more or less detail by the production and industrial engineers. Be that as it may, the foreman has a large influence on how fast and how good a part or a product gets through his department. To borrow a foundryman's phrase, "He controls the sand." Moreover, the opinion of a good, capable foreman of how this worked, or how that occurred, or why this or that was good or poor provides a lot of background knowledge and information to the fulltime methods man, and thus influences what is planned and placed in production on his floor. That influence can range from active resistance through enthusiastic cooperation with considerable effect on what is accomplished in actual production.

There is not a full-time methods man who has not learned to his sorrow the necessity to win the cooperation of an experienced and capable department foreman if a design change, or a method change, or a quality change is to get into actual production with the minimum of delay and all around fussing. The on-the-ball department foreman has such control over his personnel, and has their loyalty to such a degree, that he can put an outsider so completely behind the "eight-ball" and keep him there so quietly that the outsider may never realize what's going on. Yes, the enthusiastic cooperation of a foreman trained in the techniques of method improvement can be helpful to every member of the full-time methods team.

The foreman can assist directly the company-wide methods improvement program by methods improvements of his own. The techniques are simple, quickly learned and easily applied. He can tackle one activity after another through the use of the *Written Record*. He knows method improvement is part of his job, and will do effective work at it when trained.

Thus, an alert management will do those things necessary to utilize to the full the contributions of a foreman as a kibitzer, as a cooperative helper and as a methods man himself. The foreman will respond with worthwhile Method Improvements when Management sets up the *Improvement Function* as part of the responsibility of job as a foreman, and judges his contributions. *He can be held as accountable for contributions to Method Improvement to the same degree, and with the same need to show results, as he is held accountable for production schedules, human relations, quality and costs.*

Resistance to Change — Resentment of Criticism

It may well be the reaction and feeling of the reader at this point that if what has been said is true, if what is claimed can be demonstrated to be so, if by method improvement training a foreman can become a valued member of the company-wide methods improvement team, why isn't he just that in every plant, including the plant of the reader? From trade knowledge and experience the reader knows that full and effective help from the foreman is obtained in all too few plants, and perhaps in his own. What then holds back this proven idea, this demonstrable technique? What are such effective hindrances to utilizing, as James F. Lincoln, president of the Lincoln Electric Company said, "the productive power, initiative, and intelligence latent in every person." Why can't Work Simplification seeds be planted and always sprout,

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grow and flower into fruits of delicious savings from waste reduction and method improvement?

There are plants in which the top management relies entirely on the efforts of the full-time methods men to increase productivity—and their faith may be well founded. A long-range consistent policy of attracting top-flight men into the company and a long-range, well-rounded, fully-developed training program may always provide a full-time methods team that keeps the company sufficiently ahead of its competition at all times that there is little or no thought of developing part-time help from scores, hundreds, even thousands of foremen who are willing to help and can help on Method Improvement when trained and inspired.

There are plants in which top management knows that part-time help is available from the foremen to back up the full-time methods team in the battle to meet the constant customer demands for more value at less cost, but it is unwilling or unable (the effect is the same) to take the time and to make the effort to do the necessary training of the scores, hundreds, or even thousands of foremen who are willing and able to help when trained. In plants such as these, top management backs away from training its foremen and key men in methods improvement because the foremen's help on that is not the direct, visual, indispensable help that it is on production schedules, human relations, quality, and costs. Top management in these plants knowingly press the foremen so hard on the problems of daily production that it fears any relaxation of the pressure will cause direct losses that will not be made up by the foremen's contributions to method improvement. The top management of these plants does not realize that training in methods improvement enhances a foreman's ability on every problem, and gets the bonus of method improvements besides—as the kibitzer, the cooperator, the improver.

However, by and large, the top management of most plants realizes the need for any help it can get on method improvement, and has taken steps of a kind to obtain such help from its foremen and key men. The top management of most of these plants know that not always are their efforts fully effective, that results have not matched expectations. In those plants where something more is expected, something more must be done to overcome the major obstacles, the formidable road blocks to methods improvement. Resistance to Change—Resentment of Criticism—*the arch enemies of Method Improvement.*

RESISTANCE TO CHANGE and *RESENTMENT OF CRITICISM* are two of the most universal and potent traits of human nature. These are the effective hindrances to utilizing the "productive power, initiative, and intelligence latent in every person." The big rocks, the little rocks, and the sand of Resistance to Change and Resentment of Criticism make the barren soil in which the seeds of Work Simplification do not sprout, grow, and flower into fruits—in that soil method improvement ideas die.

The reader has but to check himself for a day to demonstrate to himself how potent and universal they are. He has but to watch the reactions he gets as he tries to promote the most trivial change or new idea. Or, more impressive, notice *his own reactions* to a suggested change or a new idea, especially if there is a hint of criticism of the way he is doing a job.

We have all mankind for company. We are all human. For example, on March 25, 1947 the Associated Press carried this news item: A paper on which Thomas Alva Edison penciled his disbelief in the internal energy of the atom is among 379 rare letters, documents, and autographs offered at public auction in Philadelphia. To the question, "Will it be possible to harness the power in the atom?" Edison wrote: "As to the atom, I do not believe it has any internal energy as claimed. Everybody else believes it has . . . !" *Even Edison Slipped!*

The common sense attack of Work Simplification by the foreman on the way in which work is done will uncover opportunities to reduce waste and improve methods. A study of the opportunities will show the changes that are practical, that can be put into effect in a routine manner, and that will save money either through reduced waste, increased production, or improved quality. However, the money will not be saved until the changes have been made and the new routines are in actual use.

Unfortunately, getting a new idea into use is a tough problem at all times. The difficulty is a common one—it exists in every business. Resistance to change and resentment of criticism are universal. The first major experience of a newly appointed foreman is usually to find out that not every employee is as certain as he is that something *Can Be Done,*

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or is as anxious to *Do It Now. He* soon finds that much suggestion, persuasion, gentle pushing, and a very discreet use of the force of his position are necessary to secure even moderate effort and cooperation in the simple day-by-day activities, let alone enthusiastic effort and actual help in the more difficult job of method improvement. The foreman runs head-on into "human nature" very soon after his supervisory appointment—and he continues to meet it, it seems to him, at every turn through all his days, months, and years in a supervisory capacity.

Since resistance to change and resentment of criticism are such powerful and universal obstacles to what Work Simplification tries to do, the push behind an improvement idea must be strong enough to overcome the resistance and resentment caused by the change itself, with enough power left over to carry the improvements through to successful operation. There would never have been an improvement of any kind at any time if the fellow with the NEW idea had stopped at the first, "*It Can't Be Done*," or "*It Won't Work*."

If, then, *Resistance to Change* and *Resentment of Criticism* are such universal and powerful obstacles to improvement, what forces have counteracted and overcome them sufficiently to give us the high standard of living we are enjoying today? A fair question. There are two major forces: *Men who, through some urge, must improve things, and competition.*

As to competition, it is the force that "puts us to work or out of work." Is there any *Surer* way for a company to go out of business than to follow a policy of *Never* making an improvement? Fire losses are recouped through insurance. Reorganization after bankruptcy has kept many companies in business. Redesigned products have brought renewed life to untold organizations.

What employee would stay with his company, come what may, if he should find a notice on the bulletin board signed by the president which read: "From now on it shall be the policy of this company never to make an improvement in any product or in any work." Every company must at least keep abreast of its competition in its industry. To do less than that is to be forced out of business eventually.

The Necessary Climate for Work Simplification

What is necessary to keep resistance to change and resentment of criticism from having a potent influence on the daily actions of the employees? What must be done to have the foreman play an important role in the day-by-day plant-wide activities to increase productivity? What is required of top management to mesh the foreman's improvement work with the company-wide method improvement program? To have in force within its organization the answer to these questions is a major responsibility of top management. That answer is to provide a day-by-day operating climate that stimulates the foreman to participate in the company-wide method improvement program. If that is done, the company will reap the benefits of his kibitzing, cooperating, and improving.

What is required to provide the necessary climate for Work Simplification is simple, but requires the best from management to provide it. It is for top management to spend the time and effort and to take the personal interest to convince plant management that complete foreman participation in increased productivity is a must, and then to have a persistent follow-up to see that plant management develops and maintains high foreman participation. It is for plant management to see to it that the foreman is allowed and takes the time to put time and effort on methods. It is for plant management to so conduct itself that the foreman is not pressured away from methods, but instead is held as responsible for his methods work as for any other foreman activity. It is for plant management to convince the foreman through its day-by-day actions that good methods work is expected and appreciated and is a distinct factor in how well a foreman is thought of by his superiors. It is for plant management to do those things that sufficient time, effort, and a strong personal interest will find can be done to raise the morale of the foremen through belonging, participating, and accomplishing in methods improvement. In short, for plant management to do in a simple, straightforward manner what is necessary to keep the *desire* of the foreman to make methods improvements at a high and higher pitch.

The deadening effects of resistance to change and resentment of criticism will be reduced only to the extent that the inspiring effects of enthusiastic cooperation, understanding, and tolerance trickle down from top management through plant management to the foreman — and in trickling down, to become a larger and larger stream because more and more individuals are contributing and thus reducing the effect of resistance to change and resentment of criticism more and more. Is this corny? Is this flag-waving? *No, No, because only INSPIRATION is powerful enough to create a climate that reduces resistance and resentment.*

To conclude, competent and foresighted Management can see to it that there is an atmosphere throughout the whole organization which welcomes improvement ideas from foremen, develops them to the fullest extent, *and insists upon* a continuous flow of methods improvements from the foremen.

Yes, management has a vital interest in Work Simplification. It can develop through Work Simplification foremen who will cooperate with and assist the full-time methods men, as well as make worthwhile method improvements themselves. But, there is a price to pay! The *desire* to make method improvements must be raised to new heights. Only management can do that. If management will pay the price in time, effort, and personal interest to create and maintain that desire, the foreman will respond with a flood of method improvement ideas. ■

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Use Of Rate Of Return On Investment

by Othel D. Westfall, Ph. D., C. P. A.

Professor of Accounting
The University of Oklahoma
Norman, Oklahoma

THE EXPECTED rate of return on capital to be employed normally is, or should be, the dominant consideration in business investment decisions. There are various methods used in relating estimated return to estimated investment to produce an estimated rate of return. The methods commonly used are open to the objection that they do not produce a realistic rate in a situation where total investment will be a declining amount. Capital employed over the life of an investment venture may decline because of the withdrawal of funds provided by depreciation and depletion, or for other reasons. The purpose of this paper is to furnish a concrete, though hypothetical, illustration of a method which is intended to produce a realistic rate of return in such a situation. Little space will be devoted to theoretical justification of the method, with the expectation that readers will judge for themselves whether the purpose is accomplished.

Some business investment decisions may not require a formal computation of estimated rate of return, as where the continuance of total operations depends upon a relatively minor investment. Normally, however, a formal computation will be desirable. For purposes of this illustration, the problem selected is that of choosing between alternative branch plant locations.

The relative desirability of alternative locations may be affected by such factors as the following:

1. Climate
2. Water supply
3. Room for growth
4. Dispersion of industry
5. Character of the community
6. Availability of financial facilities, locally or within convenient reach.
7. Availability of research facilities, as at the university or elsewhere within convenient reach
8. Distance from facilities for such major outdoor sports as hunting, fishing, etc.
9. Sales potential
10. Cost of raw material
11. Transportation facilities and costs, in and out
12. Fuel or power costs
13. Wage rates
14. Labor laws
15. Insurance rates
16. Local property or ad valorem taxes
17. Local income tax, if any
18. Local motor fuels tax
19. Miscellaneous local taxes, excluding those which will be passed directly on to the customer by addition to selling price
20. Land and facility costs
21. Local subsidies or other benefits for new concerns

It is likely that some factors in any situation will not be subject to financial measurement, and must be evaluated by judgment. For these unmeasurable factors, subjective ranking by relative importance may be helpful. Some factors may be measurable for one concern and

OTHEL D. WESTFALL had considerable professional experience before becoming a Professor of Accounting at the University of Oklahoma. As a Public Accountant, bookkeeper and auditor he was with the Charles C. Porter Company of Shawnee, Ingram Drug Stores, Inc., the Oklahoma State Examiner's office, the Farm Credit Administration, Washington, D. C., the Navy Department, Barrow, Wade, Guthrie & Company of Tulsa, and with the United Nations Relief and Rehabilitation Administration in London. Professor Westfall received a B.S. in Business from the University of Oklahoma, a M.B.A. from Northwestern University and a Doctor of Philosophy in Business Administration from the University of Texas.

Figure 1
Digest of Basic Data

Estimated Sales Description	*M.C.*	*S.W.*
First Year	$80,000	$60,000
Increase per annum:		
Next 4 years	75,000	60,000
Next 20 years	6,000	10,000
Variable Costs (as % of sales)		
Materials (F.O.B. origin)	20%	20%
Transportation in	1%	2%
Transportation out	2%	2%
Fuel and power	2%	1%
Wages and payroll taxes	40%	35%
Travel expense	1%	2%
Miscellaneous expense	4%	3%
Total	70%	65%
Annual Fixed Cost		
Depreciation:		
First 15 years	$ 9,000	$ 8,000
Next 10 years	10,000	9,000
Insurance	1,500	1,500
Property tax:		
First 5 years	3,000	(a)
Next 10 years	2,500	1,500
Next 10 years	2,000	1,000
Miscellaneous taxes:		
First 5 years	1,000	1,000
Next 10 years	1,200	1,200
Next 10 years	1,500	1,500
Salaries (annual)	37,500	30,000
State income tax rate (after Federal tax)	—	4%
Average Current Assets		
First year	$16,000	$12,000
Increase per annum:		
Next 4 years	15,000	12,000
Next 20 years	1,200	2,000
Land and Facilities		
Cost:		
Land	$25,000	(b)
Building	150,000	$100,000
Equipment:		
Initial	60,000	60,000
Replacement— 15 years	75,000	75,000
Value in 25 years:		
Land	36,667	25,000
Building	25,000	—
Equipment	25,000	25,000

(a) New industry exempted for 5 years.
(b) Plant site donated. Doners' cost $5,000.

not for another. For example, the chemical composition of the local water supply might necessitate treatment before usage for one purpose and not for another.

For illustrating measurement of the factors which are measurable, let us take the case of Magic Products, Inc., an electronics concern which is considering the establishment of a branch plant at either a location in the "middle central" section of the country or at a location in the southwest. Considering the survival risk in this new industry, it has been determined that the business investment other than in land must promise a return of at least 10 percent after corporate income tax. A rate of 6 percent is acceptable on land. The location will make no difference in these rates of capital "cost." It is expected that all spare cash generated by this branch will be used for plant expansion elsewhere. The results of a market survey, plant and facility cost estimates, and forecasts of sales and variable operating costs, are available for each location. A digest of these data, reflecting some preliminary processing by the accountant, appears in Figure 1.

Estimates of return on investment for the two locations appear in Figures 2 and 3. Conventional depreciation is first included in fixed costs, to facilitate computation of income taxes, and then is added back. The reason for adding back depreciation is that the method for relating return to investment will automatically provide for amortization of investment, as will be amplified later on. The estimates are limited to 25 years since the life of the building at the southwestern location is taken to be the practical life of that possible venture. There is no basis for comparison of alternatives beyond the point where one would cease to exist.

Since the total investment will be lower, and since the appearance of the estimated data on return is better in absolute form, it seems a foregone conclusion that from the standpoint of measurable factors the southwestern location is to be preferred over the middle central location. If there had been no difference in revenue associated with the choice, but other factors had remained the same, then the lower annual expense of the southwestern location apparently would have decided the issue. Of course, the decision to invest or not to invest, at one of the two locations as distinguished from the choice of location, cannot be made rationally without giving consideration to estimated revenue. In the present case we have all the information needed to develop a financial basis for the investment decision, bearing in mind that factors not financially measurable may affect the decision. In other words, we shall proceed to compute estimated rate of return on investment. For illustrative purposes, and to satisfy any doubts as to the financial choice of location, the computation will be made for each location.

The next steps will be concerned with determinatoin of the amounts of investment which will earn the series of an-

Figure 2
Middle Central Location
Estimation of Return on Investment

Year	*1* —	*2* —	*3* —	*4* +	*5* =	*6*
1	$ 80,000	$ 56,000	$ 52,000	$ —	$ 9,000	$(19,000)
2	155,000	108,500	52,000	—	9,000	3,500
3	230,000	161,000	52,000	*	9,000	26,000
4	305,000	213,500	52,000	5,750	9,000	42,750
5	380,000	266,000	52,000	23,640	9,000	47,360
6	386,000	270,200	51,700	24,627	9,000	48,473
7	392,000	274,400	51,700	25,473	9,000	49,427
8	398,000	278,600	51,700	26,319	9,000	50,381
9	404,000	282,800	51,700	27,165	9,000	51,335
10	410,000	287,000	51,700	28,011	9,000	52,289
11	416,000	291,200	51,700	28,857	9,000	53,243
12	422,000	295,400	51,700	29,703	9,000	54,197
13	428,000	299,600	51,700	30,549	9,000	55,151
14	434,000	303,800	51,700	31,395	9,000	56,105
15	440,000	308,000	51,700	32,241	9,000	57,059
16	446,000	312,200	52,500	32,711	10,000	58,589
17	452,000	316,400	52,500	33,557	10,000	59,543
18	458,000	320,600	52,500	34,403	10,000	60,497
19	464,000	324,800	52,500	35,249	10,000	61,451
20	470,000	329,000	52,500	36,095	10,000	62,405
21	476,000	333,200	52,500	36,941	10,000	63,359
22	482,000	337,400	52,500	37,787	10,000	64,313
23	488,000	341,600	52,500	38,633	10,000	65,267
24	494,000	345,800	52,500	39,479	10,000	66,221
25	500,000	350,000	52,500	40,325	10,000	67,175
Totals	$10,010,000	$7,007,000	$1,302,000	$678,910	$235,000	$1,257,090

1 = Sales
2 = Variable cost
3 = Fixed cost
4 = Federal income tax
5 = Depreciation
6 = Return on investment before depreciation

* No tax, due to net operating loss carryover

Figure 3

Southwestern Location

Estimation of Return on Investment

Year	1	— 2	— 3	— 4	— 5	+ 6	= 7
1	$ 60,000	$ 39,000	$ 40,500	$ —	$ —	$ 8,000	$(11,500)
2	120,000	78,000	40,500	*	60	8,000	9,440
3	180,000	117,000	40,500	1,125	855	8,000	28,520
4	240,000	156,000	40,500	14,945	1,142	8,000	35,413
5	300,000	195,000	40,500	24,815	1,587	8,000	46,098
6	310,000	201,500	42,200	25,661	1,626	8,000	47,013
7	320,000	208,000	42,200	27,306	1,700	8,000	48,794
8	330,000	214,500	42,200	28,951	1,774	8,000	50,575
9	340,000	221,000	42,200	30,596	1,848	8,000	52,356
10	350,000	227,500	42,200	32,241	1,922	8,000	54,137
11	360,000	234,000	42,200	33,886	1,997	8,000	55,917
12	370,000	240,500	42,200	35,531	2,071	8,000	57,698
13	380,000	247,000	42,200	37,176	2,145	8,000	59,479
14	390,000	253,500	42,200	38,821	2,219	8,000	61,260
15	400,000	260,000	42,200	40,466	2,293	8,000	63,041
16	410,000	266,500	43,000	41,735	2,351	9,000	65,414
17	420,000	273,000	43,000	43,380	2,425	9,000	67,195
18	430,000	279,500	43,000	45,025	2,499	9,000	68,976
19	440,000	286,000	43,000	46,670	2,573	9,000	70,757
20	450,000	292,500	43,000	48,315	2,647	9,000	72,538
21	460,000	299,000	43,000	49,960	2,722	9,000	74,318
22	470,000	305,500	43,000	51,605	2,796	9,000	76,099
23	480,000	312,000	43,000	53,250	2,870	9,000	77,880
24	490,000	318,500	43,000	54,895	2,944	9,000	79,661
25	500,000	325,000	43,000	56,540	3,018	9,000	81,442
Totals	$9,000,000	$5,850,000	$1,054,500	$862,895	$50,084	$210,000	$1,392,521

1 = Sales
2 = Variable cost
3 = Fixed cost
4 = Federal income tax
5 = State income tax
6 = Depreciation
7 = Return on investment before depreciation

* No tax, due to net operating loss carryover

nual returns already computed. In so doing a distinction will be made between investment which is not amortizable, such as land and current assets, and investment which is amortizable through periodic partial recoveries, as in the case of depreciable properties. Of course, current asset items are in a state of continual conversion from one to the other, but the total amount of current assets normally is not expected to decline as does the unamortized balance of depreciable properties.

In Figure 4 the cost of land is reduced by the present value of estimated appreciation in land value less the prospective income tax on the estimated appreciation. The purpose for this reduction is to arrive at that portion of the investment which is made for land use during the business venture period, as opposed to investment for appreciation. Present value of estimated appreciation is determined by the use of simple discount since, unlike the case of depreciable properties, there will be no problem of reinvesting periodic capital recoveries with the attendant expense and loss of return through delays in reinvestment. In Figure 5 the investment allocable to land use is combined with estimated average current assets, to determine total investment not subject to depreciation or amortization.

The computation in Figure 6 is designed to arrive at that portion of investment in depreciable properties which is properly chargeable to the venture

Figure 4

Estimation of Investment for Land Use

Description	M. C.	S. W.
Value in 25 years	$36,667	$25,000
Tax basis	25,000	5,000
Estimated capital gain	11,667	20,000
Estimated income tax:		
Federal	2,917	5,000
State	—	200
Total	2,917	5,200
Value in 25 years	36,667	25,000
Cost	25,000	—
Estimated gross gain	11,667	25,000
Income tax	2,917	5,200
Estimated net gain	8,750	19,800
Divided by (a)	250%	250%
Present value of estimated gain	3,500	7,920
Cost	25,000	—
Investment for use	$21,500	$(7,920)

(a) To discount for 25 years at 6% per annum simple discount, the acceptable rate on land.

Figure 5

Estimation of Non-Amortizable Investment

Description	Middle Central		Southwestern	
	Current Assets	Total	Current Assets	Total
Land Use		$ 21,500		$(7,920)
Year				
1	$ 16,000	37,500	$ 12,000	4,080
2	31,000	52,500	24,000	16,080
3	46,000	67,500	36,000	28,080
4	61,000	82,500	48,000	40,080
5	76,000	97,500	60,000	52,080
6	77,200	98,700	62,000	54,080
7	78,400	99,900	64,000	56,080
8	79,600	101,100	66,000	58,080
9	80,800	102,300	68,000	60,080
10	82,000	103,500	70,000	62,080
11	83,200	104,700	72,000	64,080
12	84,400	105,900	74,000	66,080
13	85,600	107,100	76,000	68,080
14	86,800	108,300	78,000	70,080
15	88,000	109,500	80,000	72,080
16	89,200	110,700	82,000	74,080
17	90,400	111,900	84,000	76,080
18	91,600	113,100	86,000	78,080
19	92,800	114,300	88,000	80,080
20	94,000	115,500	90,000	82,080
21	95,200	116,700	92,000	84,080
22	96,400	117,900	94,000	86,080
23	97,600	119,100	96,000	88,080
24	98,800	120,300	98,000	90,080
25	100,000	121,500	100,000	92,080
Totals		$2,539,500		$1,602,000

Figure 6
Estimation of Amortizable Investment

Description	M.C.	S.W.
Future Equipment Cost:		
1. Estimated— 15 years	$ 75,000	$ 75,000
2. Divided by (a)	1.4699	1.4482
3. Discounted cost	51,024	51,788
Initial Investment:		
4. Building	150,000	100,000
5. Equipment	60,000	60,000
6. Total	261,024	211,788
Value in 25 years:		
7. Building	25,000	—
8. Equipment	25,000	25,000
9. Total	50,000	25,000
10. Divide by (b)	350%	350%
11. Present value	14,286	7,143
Amortizable Investment (6-11)	$246,738	$204,645

(a) Assuming that a fund established now would earn 5%, before income taxes, compounded annually for 15 years.

(b) To discount for 25 years at 10% per annum simple discount, the acceptable rate.

period. A feature of this computation is allowance for the expectancy that equipment of relatively short useful life will be replaced during the period. The present value of expected salvage value at the end of the venture period is determined by the use of simple discount, since there will be no problem of reinvesting portions of this salvage value during the period.

A realistic rate of return is conceived herein as that certain rate which will accomplish the following:

1. Will allocate ratable portions of a series of yearly returns to the average non-amortizable investments for the respective years; and,
2. When used as a discount rate, will equate the series of annual return remainders to the amortizable investment.

The theory upon which the rate is used to discount the annual return remainders, or the portions of returns allocable to depreciable properties, may be stated as follows:

1. Any annual return on investment in depreciable properties is derived from that portion of the investment which is exhausted and recovered that year, not to the portions of investment exhausted in prior years nor to the portions which will be exhausted in subsequent years.
2. At the date of investment in depreciable property, the portions of investment recoverable in earlier years are more valuable than portions recoverable in later years; that is, time or duration of investment is a factor in present value and in rate of return.

Either simple discount or compound discount may be used in equating annual return remainders to depreciable or amortizable investment, depending upon the circumstances. If it is expected that annual recoveries of investment will be reinvested immediately and without particular reinvestment expense, as where funds provided by depreciation will be absorbed by growing working capital requirements, then simple discount is indicated. On the other hand, compound discount will tend to compensate for expected delays and expense incident to reinvestment, as where funds are expected to be reinvested intermittently in plant expansion. Where recovered funds are required by contract or otherwise to be immobilized for extended periods of time, such funds may be treated as non-amortizable investment in the calculations.

The estimated rate of return which will accomplish the desired objectives is found by a trial and error process. In equating annual return remainders to amortizable investment, simple discount requires less calculation. The use of logarithms will facilitate the calculation of compound discount. In either case, a calculating machine is very useful.

Figure 7 reflects two trials for the middle central location. The 10 percent rate produces a total present value or amortization of $272,879, which is considerably above the amortizable investment of $246,738 as shown on Figure 6. The 11 percent rate produces a total amortization of $237,638, which is below the total amortizable investment. From inspection it appears that the exact rate is in the vicinity of 10.75 percent, which should be close enough for practical purposes. A closer approximation can be made by formal calculation, although exact interpolation would be an involved process.

Figure 8 reflects two trials for the southwestern location. The trial at 14.5 percent produces total amortization of $203,108, which is close enough to the total amortizable investment of $204,645 as shown on Figure 6.

The financial measurements which have been made are, of course, no more reliable than the basic data which are presumed to have been derived from such sources as market surveys, revenue and cost forecasts, and engineering esti-

Figure 7
Middle Central Location
Estimated Rate of Return on Investment

Year	Return	Trial at 10% 1	Trial at 10% 2	Trial at 10% 3	Trial at 11% 1	Trial at 11% 2	Trial at 11% 3
1	$(19,000)	$ 3,750	$(22,750)	$(20,682)	$ 4,125	$(23,125)	$(20,833)
2	3,500	5,250	(1,750)	(1,446)	5,775	(2,275)	(1,846)
3	26,000	6,750	19,250	14,463	7,425	18,575	13,580
4	42,750	8,250	34,500	23,566	9,075	33,675	22,184
5	47,360	9,750	37,610	23,353	10,725	36,635	21,742
6	48,473	9,870	38,603	21,791	10,857	37,616	20,111
7	49,427	9,990	39,437	20,239	10,989	38,438	18,515
8	50,381	10,110	40,271	18,787	11,121	39,260	17,037
9	51,335	10,230	41,105	17,434	11,253	40,082	15,674
10	52,289	10,350	41,939	16,170	11,385	40,904	14,407
11	53,243	10,470	42,773	14,993	11,517	41,726	13,240
12	54,197	10,590	43,607	13,896	11,649	42,548	12,163
13	55,151	10,710	44,441	12,874	11,781	43,370	11,169
14	56,105	10,830	45,275	11,923	11,913	44,192	10,253
15	57,059	10,950	46,109	11,039	12,045	45,014	9,409
16	58,589	11,070	47,519	10,343	12,177	46,412	8,740
17	59,543	11,190	48,353	9,567	12,309	47,234	8,013
18	60,497	11,310	49,187	8,848	12,441	48,056	7,345
19	61,451	11,430	50,021	8,180	12,573	48,878	6,730
20	62,405	11,550	50,855	7,560	12,705	49,700	6,165
21	63,359	11,670	51,689	6,986	12,837	50,522	5,646
22	64,313	11,790	52,523	6,453	12,969	51,344	5,170
23	65,267	11,910	53,357	5,960	13,101	52,166	4,732
24	66,221	12,030	54,191	5,503	13,233	52,988	4,330
25	67,175	12,150	55,025	5,079	13,365	53,810	3,962
Totals	$1,257,090	$253,950	$1,003,140	$272,879	$279,345	$977,745	$237,638

1 = Return allocable to non-amortizable investment
2 = Remainder of return
3 = Present value of remainder of return, produced by compound discount at the trial rate

Figure 7 reflects two trials for the middle central location.

CIPM Reports . . .

Harold F. Smiddy Wins Wallace Clark Award for 1958

CIPM takes great pleasure in announcing that Harold F. Smiddy, Vice President of the General Electric Company and Vice President of CIPM, is the recipient of the 1958 Wallace Clark Award for distinguished contribution to scientific management in the international field. Mr. Smiddy, a Fellow of SAM, Director and Vice President of Management Research and Development of SAM from 1947 to 1953 and winner of the Taylor Key in 1953 was a Contributing Editor to *Advanced Management* from 1950 to 1953.

CIPM Expands Its Activities

In recent months, the Council has entered another phase of its international management exchange activities by organizing and conducting management study programs for a number of groups of businessmen who have come to this country at their firms' or their own governments' expense. Since 1950, the Council has operated management study projects for management representatives from Europe, the Far East, and Latin America in conjunction with the U. S. Government's Technical Assistance Program, through which the industrial economies in participating countries were strengthened to the point that now many European businessmen are visiting this country to make independent studies of our management techniques. In cooperation with the Council's counterpart in Germany, the Rationalisierungs-Kuratorium der Deutschen Wirtschaft (the German Association for Scientific Management), the Council has organized and conducted study programs for five groups of German businessmen whose interests varied from wholesale drygoods, to electric, gas and water supply, to nuclear power.

During the coming four months, six groups will come to the United States from Germany, several of which are particularly interested in the management problems faced by small and medium sized firms; how they can exist and work economically successfully with larger concerns, how managers of the younger generation who operate these firms fulfill their functions, how they are trained, and in short, how modern methods of plant management planning and control, which are often felt in Germany apply only to large firms, can be implemented in small ones that cannot afford organization and planning departments of their own. Many of the people who will come to the United States in these groups have met with visiting American management experts in Germany.

Some of the German groups will be studying a specialized phase of management such as management problems in the construction and operation of hospitals—how to shorten the patient's hospitalization period, which is half as long in the United States as in Germany, how to improve medical insurance plans, and how hospitals can best be constructed so as to reduce nursing costs. Another group will study management aspects of the wholesale and retail food industry in order to meet the particular conditions in this field in the Saar, where the Customs and Currency Union with France has caused a different development in this industry than is found in West Germany.

One of the facets of the American management picture that interests almost all these groups is our management associations and societies; how they operate to develop managers, and particularly, how the chapter organizations function. In this connection, many of the groups have specifically requested a visit to an SAM chapter meeting so that they can see at first hand how managers in a community meet regularly to learn from each other.

Jane Dustan
Editor, CIPM

Figure 8
Southwestern Location
Estimated Rate of Return on Investment

Year	Return	Trial at 15% 1	Trial at 15% 2	Trial at 15% 3	Trial at 14.5% 1	Trial at 14.5% 2	Trial at 14.5% 3
1	$(11,500)	$ 612	$(12,112)	$(10,532)	$ 592	$(12,092)	$(10,561)
2	9,440	2,412	7,028	5,315	2,332	7,108	5,421
3	28,520	4,212	24,308	15,983	4,072	24,448	16,286
4	35,413	6,012	29,401	16,808	5,812	29,601	17,221
5	46,098	7,812	38,286	19,035	7,552	38,546	19,585
6	47,013	8,112	38,901	16,822	7,842	39,171	17,382
7	48,794	8,412	40,382	15,181	8,132	40,662	15,759
8	50,575	8,712	41,863	13,684	8,422	42,153	14,267
9	52,356	9,012	43,344	12,321	8,712	43,644	12,901
10	54,137	9,312	44,825	11,080	9,002	45,135	11,652
11	55,917	9,612	46,305	9,952	9,292	46,625	10,512
12	57,698	9,912	47,786	8,931	9,582	48,116	9,475
13	59,479	10,212	49,267	8,007	9,872	49,607	8,531
14	61,260	10,512	50,748	7,172	10,162	51,098	7,675
15	63,041	10,812	52,229	6,418	10,452	52,589	6,898
16	65,414	11,112	54,302	5,802	10,742	54,672	6,263
17	67,195	11,412	55,783	5,183	11,032	56,163	5,619
18	68,976	11,712	57,264	4,627	11,322	57,654	5,038
19	70,757	12,012	58,745	4,127	11,612	59,145	4,514
20	72,538	12,312	60,226	3,679	11,902	60,636	4,041
21	74,318	12,612	61,706	3,278	12,192	62,126	3,616
22	76,099	12,912	63,187	2,919	12,482	63,617	3,234
23	77,880	13,212	64,668	2,598	12,772	65,108	2,891
24	79,661	13,512	66,149	2,311	13,062	66,599	2,582
25	81,442	13,812	67,630	2,054	13,352	68,090	2,306
Totals	$1,392,521	$240,300	$1,152,221	$192,755	$232,300	$1,160,221	$203,108

1 = Return allocable to non-amortizable investment
2 = Remainder of return
3 = Present value of remainder of return, produced by compound discount at the trial rate

mates. But assuming that these data have been supplied by qualified people, they represent the best available foundation for decisions. As has been pointed out, factors not measurable may enter into the decisions. These factors may be ranked or weighted in accordance with their relative importance, within the judgment of management, not only in relation to each other but also in relation to estimated rate of return on investment. The final decision to invest or not to invest at one of the two locations will also involve comparison of estimated rate of return with the rate of capital cost which, in this case, has been assumed as part of the basic data. ■

S.A.M. is a charter member of CIPM, the Council for International Progress in Management, the American non-profit, non-political organization devoted to the practice of scientific management on the international level. CIPM is in turn a member of the International Committee of Scientific Management (CIOS) which represents the organized management societies of twenty-six nations.

Performance Analysis

by Nathan D. Edwards
Chief, Management Division
Office of the Comptroller
U. S. Army
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PERFORMANCE Analysis provides the basis for determining the effectiveness with which the manpower of an organization is being utilized; that is, the balance that is being maintained between the volume of work performed and the manpower utilized.

Through implementation of various Performance Analysis Systems, several phases of management improvement have been facilitated. It has been possible to control backlogs of work, to improve organization and operating procedures where performance effectiveness was low, and to scientifically plan non-productive time (vacation, training, etc.) to coincide with slack periods of work, thus preventing unnecessary overtime during peak periods. Areas requiring management surveys, work simplification studies, and personnel training have been spotted and the results of management action measured by analysis of data accumulated under various systems.

The purpose of this article is to present a simple, inexpensive, yet accurate method of performing a continuous and systematic appraisal of the effectiveness of an organization. The method has been successfully applied to a wide variety of operations and has proved itself to be an expedient substitute for the more costly scientifically-engineered work measurement programs.

This discussion will be developed around the two primary phases under which the method was approached; namely, the integrated reporting system, and the performance analysis system.

The Integrated Reporting System

The primary source of information upon which performance analysis is based is the integrated reporting system. This system should be designed to provide all required data on the volume of work performed and the manpower utilized. Work load data is not required for all employees. However, both productive and non-productive time of all employees must be reported to permit verification with payroll records.

Development of the reporting system begins with a functional definition of all work performed by an organization. Each task is classified into a measured or an unmeasured area. Measured areas include all operations for which a definite end product provides the basis for determining the number of employees to be assigned. For example, a typing operation might be measured by the number of letters prepared or documents typed; a shipping operation by tons or number of items shipped etc. These end products will serve as the work units by which the work effort is measured. Unmeasured areas include those operations which use factors other than the volume of work performed to determine the number of employees to be assigned. This includes administrative personnel, consultants, research workers etc. Unmeasured areas account for a relatively small portion of the entire staff and are not represented by work units.

Having defined all work into measured and unmeasured areas, and assigned work units to all measured operations, the next step is to design a report which will provide management with a periodic appraisal of performance data. The scope of the report will be determined by the purposes the report is to serve. Reports now in use were adapted

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ANALYSIS OF PERSONNEL OFFICE OPERATIONS

MONTH NOVEMBER YEAR 1956

LINE NO.	OPERATION	WORK UNIT	STANDARD MAN HOURS PER WORK UNIT	WORK LOAD	OPERATION TIME		PERFORM EFFECT (F) ÷ (G)
					STANDARD (D) (E)	ACTUAL	
a	b	c	d	e	f	g	h
1	PRODUCTIVE TIME	—	—	—	—	431	—
2	UNMEASURED AREA	—	—	—	—	40	—
3	ADMINISTRATION	—	—	—	—	40	—
4	MEASURED AREA	—	—	—	398.5	391	101.9
5	RECRUITING AND SEPARATIONS	EMPLOYMENTS AND SEPARATIONS	3.50	43	150.0	161	93.2
6	COUNSELLING	EMPLOYEE COUNSELLED	25	75	19.0	20	95.0
7	TRAINING	CLASS-HOUR	4.00	8	32.0	36	88.8
8	PAYROLL	PAYMENT MADE	.083	2380	197.5	174	113.5
9	NON PRODUCTIVE TIME	—	—	—	—	43	—
10	TOTAL	—	—			474	—

FIG 1

from the basic form shown in Fig. 1. Some activities have expanded this form to show such information as backlog of work, personnel assigned, overtime, sick leave, training time etc.

Performance Analysis System

In the development of this method of performance analysis, it was decided that the procedure should be kept simple and inexpensive to permit its accomplishment without the employment of an additional staff. This was accomplished primarily by integrating both the basic data and the analytical computations into the report form, thereby distributing the work throughout the entire organization. This had the further advantage of permitting the operating levels to analyze and control their own operations and take timely corrective action independently when possible.

At the outset, the reports contained only information on the amount of work done and the time spent. Columns d, f, and h (Fig. 1.) were left blank. These reports were used as the basis for establishing statistical performance standards for each measured operation. As standards were established and approved, they were entered on the report (column d) in terms of the number of man hours required to produce one work unit. Reporting activities then computed the standard operation time and the performance effectiveness of each measured operation. The methods of computation were shown at the head of each column on the report.

These reports were summarized monthly and presented to management along with written analyses of significant areas. A chart of Performance Effectiveness was maintained, showing the status of the entire organization by month. (See Fig. 2.) The effectiveness attained by each activity during the month reported on was presented in tabular form. Excellencies and deficiencies noted during the month were included in the written analysis along with corrective actions recommended, taken, and planned.

Conclusion

Experience has established the value of Performance Analysis as an integral part of sound management. The foregoing method is an economical approach to the subject. Both recurring and one-time special study purposes have been, and will continue to be served by this method with resulting savings in money, manpower, and materials. ■

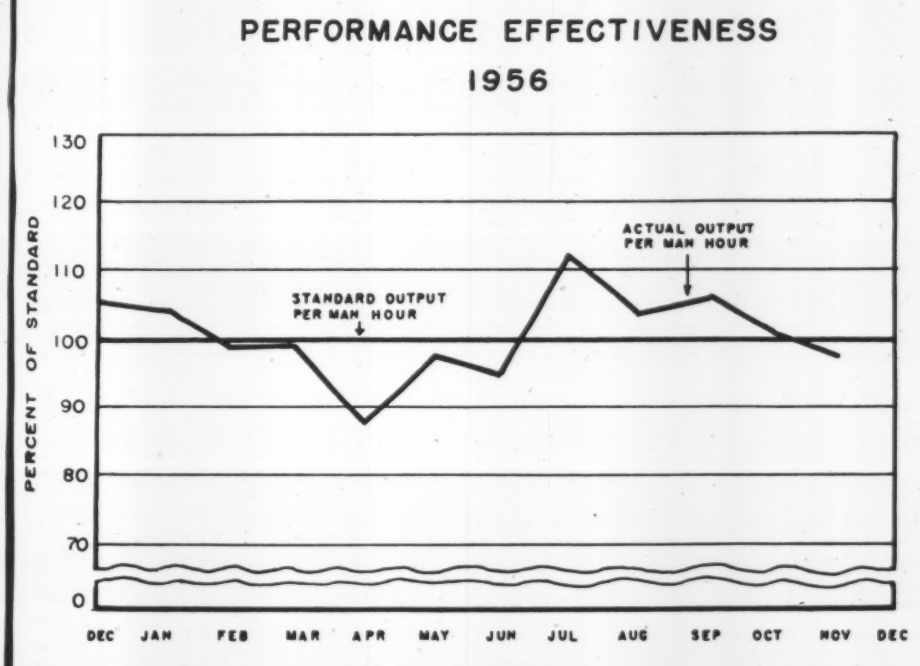

FIG 2

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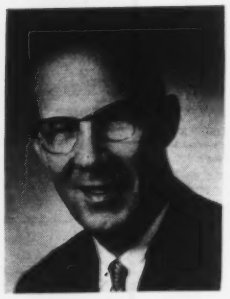


HAROLD R. BIXLER
Executive Vice President

NATIONAL AND SOUTHEASTERN REGIONAL CONFERENCE — The National S.A.M and the Chapters of the Southeastern Region have completed plans for co-sponsorship of a conference on "Better Management for More Profits" to be held May 8 and 9 in Gatlinburg, Tennessee. Selected conference subjects for the major sessions include Management's Reputation and Responsibilities in the Community, Strengthening Marketing Management, Work Sampling as a Measure of Manufacturing Management, Measuring the Accounting and Finance Functions, Measurement of Research Management, Measuring the Effectiveness of Executives, Measurement of Successful Communications, Creative Thinking and Problem Solving through "Brainstorming". A special panel session will be conducted on "Industrial Progress in the South" covering the following individual topics: Economic Problems of the South, Government and Industry in the South, and Labor Relations in the South. Special features will include motion picture on management problems, two luncheon meetings, a banquet, a ladies' program and dance. Programs will be mailed to all S.A.M members in the Southeastern Region, and the Central and Middle Atlantic Regions, with special local mailings to industry and business representatives. Complete details will be shown later in **ADVANCED MANAGEMENT.** Plans and arrangements are being developed under the leadership of Southeastern Regional Vice-President HEZZ STRINGFIELD, CLYDE CARPENTER, representing the host KNOXVILLE Chapter, and S.A.M Educational and Conference Director PAT REDDINGTON.

NEW CHATTANOOGA CHAPTER SHAPING UP—A current highlight in developments in the Southeastern Region is the organization of a new S.A.M Chapter in Chattanooga, Tennessee, with inauguration date set for January 24. Plans were completed at an organization meeting held on December 5 under the leadership of WILLIAM CHALKLEY, President, Fidelity Sales Corporation and past president of the KNOXVILLE Chapter. His executive committee includes CAVE RICHARDSON, TOM GERAGHTY, PAUL VIALL, with assistance from HEZZ STRINGFIELD, Southeastern Regional Vice President, CHARLES E. McCURRY President, KNOXVILLE Chapter, HARRY MOORE, former president, GEORGIA Chapter, Professor CHARLES C. THOMPSON, University of Chattanooga, HAROLD L. PETERSON, Administrator, Baronness Erlanger Hospital, and National Executive Vice President, HAROLD R. BIXLER, among others. Chairman of the Board, JOHN B. JOYNT, will deliver the principal address at the inauguration on "Executive Appraisal and Management Development". **Other current new chapter prospects in the region include the Tri-Cities Area of Bristol, Kingsport and Johnson City, Tennessee, and Jackson, Mississippi.**

COOPERATIVE RELATIONSHIPS ESTABLISHED WITH INDUSTRIAL MANAGEMENT INSTITUTE OF ITALY—All members with present or possible future interests in Italy can benefit from the reciprocal arrangements recently established between the Industrial Management Institute of Italy and S.A.M. This includes (1) Exchange of our official publications. (2) Permission to reprint articles. (3) Regular S.A.M memberships available to their representatives. (4) Opportunities for S.A.M members to participate in their meetings, and possibly to speak on their special management subjects. (5) Participation through planned visits and inspections of local facilities. (6) Contacts with local industry, governmental agencies and educational institutions. (7) Assistance in the development of S.A.M chapters in the major industrial and business centers. The above follows approved policy in carrying out similar relationships for agencies in other countries, through such contacts as the Council for International Progress and Management, International Cooperation Administration of the United States, the U. S. Department of Labor, U. S. Department of Commerce, and others.

S.A.M NATIONAL OPERATIONS RESEARCH CONFERENCE—The first full mailing of the final program for the third annual S.A.M National Operations Research Conference has now been completed. All details are set for this outstanding event which will be held at the Hotel New Yorker in New York City on February 6 and 7. The theme of the conference this year is "Managing Progress Through Operations Research", based on the premise that the most significant manner in which to increase economic welfare and business profits is through applications of scientific discoveries which increase productivity and national income. The conference is devoted to ways in which OR can help the executive manage progress so that it will be more orderly, constructive and profitable. A new contribution is the operations research and synthesis of future business so that operations can be simulated and tested in minimum time and cost, with less risk and with greater preparation for change. This is to offset the hazards involved in incorporating changes in a business with possible uncertainty and risk, disruptions in operations, premature obsolescence and maladjustment of organization and practices. A special conference feature will be the five simultaneous round table discussions on subjects covered during the day, at the closing sessions of both days. Opportunity will be given members of the audience to select the discussions in which they are especially interested. Conference committee include MELVIN E. SALVESON, JOHN M. ALDERIGE, ROGER R. CRANE, GEORGE FEENEY, ALAN S. GOLDMAN, HERBERT F. KLINGMAN, DONALD G. MALCOLM, ALAN J. ROWE, JAMES TOWNSEND and PAT REDDINGTON. Advance registrations are now coming in, and all interested are urged to make early preparation.

NEW CHAPTER ORGANIZED IN MARACAIBO, VENEZUELA—S.A.M's first chapter outside the territorial United States and Canada has now been established in Maracaibo, Venezuela. Similar interest has been expressed in a number of other countries and it is anticipated that in the near future S.A.M will have an international division of chapters. Hawaii and Puerto Rico are, of course, part of the United States, with progressive chapters operating there during the last two years. S.A.M's organization brochure was translated in simplified form into Spanish, the first such publication of its kind, which was sponsored in Maracaibo by local industry and business through their Chamber of Commerce. Plans are now being developed for a charter night meeting and formal inauguration of the new MARACAIBO Chapter, in line with local ceremonies which are appropriate from the community point of view. Organization of the new chapter was completed under the leadership of STANLEY PETERS, Price Waterhouse & Co. and RICHARD T. PIRIE, Shell Oil Co. of Venezuela.

"ADVANCED MANAGEMENT" RECEIVES MORE COMPLIMENTS — The S.A.M official monthly magazine continues to receive increasing recognition throughout the country and abroad as a leading management publication. It now has a readership of over 51,000 individuals representing management leadership in all types of business and industry, and in education, government, trade and professional organizations and societies, libraries, institutions and other groups. Continuing efforts to constantly improve the format, layout, editorial content and special features have earned such typical comments as the following: from a large electrical manufacturing company which says "Certainly ADVANCED MANAGEMENT **is a splendid magazine for management"; a S.A.M member:** "ADVANCED MANAGEMENT **is worth to me all my membership dues"; a management consulting organization:** "ADVANCED MANAGEMENT **is nicely designed to keep pace with and provide leadership for management development"; a governmental agency,** "ADVANCED MANAGEMENT **is ideally suited to assist in our series of Executive Management Institutes"; an educational institution: "We regard** ADVANCED MANAGEMENT **as one of the leading management publications of interest and value to our faculty and graduate students as well". Additional advertising space in this official publication has recently been made available to some 200 selected companies and agencies. They have been sent the recent S.A.M brochure,** New Dimension — New Horizons, **with a copy of the latest issue of** ADVANCED MANAGEMENT **as a market for their products, services, executive and technical personnel requirements, and institutional public relations. All inquiries will be welcome.**

GOVERNMENT SOURCES OF INFORMATION OF SPECIAL INTEREST—The position responsibilities of many S.A.M members include contacts for various sources of data and information for use within their particular industry and business. The Department of Commerce has recently issued a reminder list of several aids which have proven helpful in providing short cuts to sources of such material, both governmental and non-governmental. These cover Business—Government Relations, Business Trends and Statistics, Government Procurement, Industrial Research, Inventions of New or Improved Products, Labor Relations Legislative Research, Manpower Studies, Market Research, Standardization, Tax Surveys, Transportation Facilities, and various Economic Studies which are necessary background for effective public relations, sales promotion and future planning. Separately available are such helpful publications as **"Pamphlet on Selected Publications Available from U. S. Department of Commerce", "Technical and Distribution Research for the Benefit of a Small Business"** (pre-

viously reported in **ADVANCED MANAGEMENT**), **"Directory of National Trade Associations," "Survey of Current Businesses," "Services to Science and Industry," "Business and Defense Services Administration," "Business Service Check List Including U. S. Government Research Reports."** For this and other such information sources write C. J. JUDKINS, Chief, Trade Association Division, Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

ANOTHER S.A.M FOUNDATION STONE—Thanks to 1st Vice President, PHIL CARROLL for his reminder about the following quotation to illustrate another reason and purpose for S.A.M. This is an excerpt from an article "Revolution in the Making" by H. J. RAND, President, Rand Development Corporation. "Try to avoid paying for work that has already been done. It is often faster and less costly to spend the time putting together present knowledge into a solution of your problem, than trying to be original".

CIVIC AFFAIRS PROGRAM MOVES AHEAD —Continuing progress in S.A.M's National Civic Affairs Program is reported by Vice President GEORGE GOETTELMAN. There are now 2 S.A.M Chapter Advisory Boards assisting over 185 hospitals. New advisory boards have been recently formed in Chapters at KNOXVILLE LONG ISLAND, ALABAMA, PORTLAND WESTERN NORTH CAROLINA with future boards probable in the areas of BINGHAMTON, LANCASTER, RICHLAND, CHATTANOOGA, GARY, LEHIGH VALLEY, SPOKANE AND HACKETTSTOWN. Some 900 copies of the monthly case studies are now being sent in response to requests for this information. Recent publicity includes articles in "Hospital Progress" and "RN—A Journal for Nurses", with others planned for national publications. Vice President GOETTELMAN has received many requests and is now scheduling talks before various individual hospitals, hospital administration organizations and community groups, in addition to S.A.M chapters and other membership organizations interested in S.A.M's Civic Affairs Program.

S.A.M NATIONAL OFFICE AND THE SUBWAY STRIKE—As at this writing the subway strike in New York City is causing great confusion, delay and interference with the normal business operations of the metropolitan area. Many individuals are unable to reach their work place and others must face long delays, in spite of early starts and the best planning. S.A.M National Office Staff loyalty is again being demonstrated in the ingenuity and perseverance which our employees are exercising in order to carry out their duties. First prize—so far—goes to Kay Vindemar, secretary to the Executive Vice President, who yesterday walked from National Headquarters at Fifth Avenue and 14th Street to her apartment on 74th Street in upper Manhattan. Quite a hike!

NATIONAL OFFICE MAILINGS — All 900 Chapter and National Officers are reminded to check their particular interests in the following combined mailings sent Chapter Presidents and National Directors since the last listings, and to broadcast the particular information they contain in line with their specific purposes: National Activities and Policies Questionnaire for Chapters, Minutes, Nov. 2, National Directors' Meeting, S.A.M Research and Development Bulletin, Past Presidents Emblem, S.A.M Seal Reproductions, Communications With Members, "About You", How to Make Your Board Meetings Most Effective, Hospital Aid Case Study No. 05-01-1 on Housekeeping, Monthly Reports on Membership by Grades and Chapters and Chapter Performance Awards Plan Competition, "What's an Association to You", Chapter Handbooks from PHILADELPHIA and RARITAN VALLEY, Outstanding Activities Awards by American Society of Association Executives (covering S.A.M Civic Affairs Award, "Improving Human Relations."

S.A.M 1957 Human Relations Award Recipient Announced

Reuben B. Robertson

THE S.A.M National Award Committee, headed by *Douglas Watson*, has selected *Reuben B. Robertson*, Chairman of the Board of The Champion Paper and Fibre Company, Asheville, N.C., as recipient of the Society for Advancement of Management's 1957 Human Relations Award. Mr. Robertson was chosen for this coveted S.A.M. award in recognition of his outstanding contribution or accomplishment in the advancement of human relations within the free enterprise system, as measured by both personal satisfaction of individual workers and the economic stability of business and industry throughout the nation.

Formal presentation of the award will take place on January 23rd at a meeting of the S.A.M Western North Carolina Chapter, which nominated Mr. Robertson for the award, with National Officers participating.

A native of Cincinnati, Mr. Robertson was recipient of the "Distinguished Citizen Award", given by the North Carolina Citizens Association in March 1957, and the Asheville Junior Chamber of Commerce elected him "Man of the Year" in 1956.

Admiral Arthur W. Radford, retired Chairman of the Joint Chiefs of Staff, will be principal speaker of the occasion.

NEW S.A.M RESEARCH BULLETIN PLANNED —The S.A.M Management and Research Development Division is planning a periodic RESEARCH BULLETIN, with initial mailing to chapter Presidents, Research Chairmen and Directors. This will provide a stimulus for chapter seminars, round tables and research on the newest information and theories in management science. First announcements have been sent to Chapter Research Chairmen and/or Presidents inviting their cooperation, that new theories, techniques, fresh and challenging viewpoints developed through chapter meetings can benefit members as a whole through the exchange of a periodic RESEARCH BULLETIN. It will be designed to reflect the Society as a logical forum for presentation, discussion and evaluation of the newest developments in the field of management. Chapters are urged to report on their speakers' contributions which might be eligible for the RESEARCH BULLETIN, or as a basis of articles in ADVANCED MANAGEMENT, or the Research Monographs on Modern Management Policy Studies.

MARKETING'S ROLE IN SCIENTIFIC MANAGEMENT—S.A.M's National Vice President for Marketing, AL N. SEARES, recommends as top reading the new 600 page publication of the American Marketing Association, **"Marketing's Role in Scientific Management."** This contains edited papers and talks given by leading authorities in the marketing field, covering such important topics as Responsibilities of Marketing Management, Product Planning and Development, Changing Trends in Advertising and Sales Promotion, Industrial Sales Compensation, Consumer Profiles, Patterns and Motivation, Sales Planning and Forecasting and many other significant areas of interest to management. A unique and valuable feature is a section devoted to discussions of the economic and marketing outlook for various major industries. Copies are available to the association's central office, 27 E. Monroe Street, Chicago 3, Illinois at the rate of $3.00 per copy for members and $5.00 for non-members. AL SEARES also reminds S.A.M readers about the valuable information in the monthly publication, **"Distribution Data Guide"**, available from the Office of Distribution, Business and Defense Services Administration, U. S. Department of Commerce, Washington, D. C. Recent issues include such subjects as Occupational Outlook, Material and Methods of Sales Forecasting, Performance and Development of Field Sales Managers, Reading for Industrial Distribution Seminars, as well as financial and business statistics.

FOREIGN POSITIONS AVAILABLE — A relatively large number of positions are now available in foreign countries for service with the United Nations Technical Assistance Program. They include work in economic surveys, industrial development and productivity, natural resources development and power, public finance, financial institutions, statistics, transport and communications, meteorology, social development, population, housing (physical planning and building), community development, social defense, social services, public administration, trade promotion, marketing, and community development. Further information may be obtained from the Technical Assistance Administration, Technical Assistance Recruitment Services, United Nations, New York 17, N. Y.

S.A.M NEW YORK CITY RATING FILM WORKSHOP—S.A.M Research and Development Division, in cooperation with the NEW YORK Chapter, will conduct a full day rating workshop for industry representatives at the Belmont-Plaza Hotel on January 31. This will be the first time since their issuance in 1950 that the internationally used S.A.M Time Study Performance Rating Films will be shown in New York City as a separate activity. Registrants will have the opportunity to rate the actual 120 performances of 24 typical factory and clerical operations and privately compare their own ratings with the composite judgments of 1200 experienced time study engineers from the U. S. and Canada, representing 181 large and small companies in a broad cross section of industry. Each rating session will be followed by a discussion period open to participants. These films, widely regarded as a classical frame of reference in work measurement, are now used by industries and universities throughout the free world. Details on registration for the New York Rating Workshop may be obtained from Dr. VINCENT FLYNN, Research Director, S.A.M, 74 Fifth Avenue, New York City 11.

TYPICAL S.A.M CHAPTER ACTIVITIES

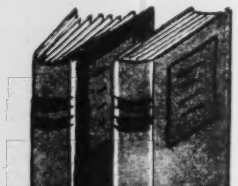
FEBRUARY 1958

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
Alabama	"Sales Management and Marketing"	Al N. Seares	Vice President, Remington Rand, Inc., New York		11
Baltimore	Seminar on Warehouse Control—Examples and Discussion			Hecht Warehouse, Erdman Avenue, Baltimore, Md.	26
Boston	"Management in the Next Decade"	E. P. Brooks	Dean, School of Industrial Management, M.I.T., Cambridge, Mass.		13
Bridgeport	"Women Business Executives" Ladies Night	Vivian Kellems	President, Kellems Cable Grip Corp.	Indian Room, Algonquin Club	4
Central Pa.	"Electronics in Accounting"	L. C. Calkins	Research Engineer, Methods Planning Div., United States Steel	Penn Belle Hotel, Bellefonte	20
Charlotte	Work Simplification Clinic (Full Day) "Cost Cutting Techniques"—Dinner Meeting	Dr. Herbert A. Lynch, Chairman		Barringer Hotel	18
Chicago	"What is the Production Executive's Job"	H. P. Steele	President, Benjamin Electric Manufacturing Co.	Furniture Club of America	25
	"Brainstorming In Industry"	Arthur Studt	Manager of Education & Training, Hotpoint Company	Furniture Club of America	11
	Panel Discussion "Girls Will Be Girls"	Marilyn French & Others		Toffenetti's Restaurant	17
	"What Management Expects of Operations Research"	John R. Lanahan	Inland Steel Company	Hardings Presidential Grill	4
	Plant Visitation—Eastman Kodak Processing Plant			1712 So. Prairie Avenue, Chicago	20
Cleveland	"Management of New Products"	Conrad Jones		Cleveland Eng. Soc. Bldg.	10
Detroit	"Production Control—It's Effect on Organization and How Organization Affects It"	J. C. Brown	Production Control Manager, Ford Division, Ford Motor Co.	Rackham Educational Memorial	18
Fox Valley	"Management Skills—New Developments and Applications"	Dr. Marvin Mundel	Vice Director, Marquette University Management Center	Elks Club	13
Greensboro	"Industrial Engineering in Small Industries"	Dr. C. A. Anderson	Department Head, Ind. Eng., North Carolina State College	Starmount Country Club	11
	Plant Visitation—United Furniture Co.			Lexington, N. C.	18
Greenville	"Industrial Financing"	Sydney Maddox	President, C.I.T., New York	Elks Club	17
Hartford	"Value Analysis"	L. D. Miles	General Electric Co.	Bond Hotel	20
Hudson Valley	"Production Control—The Heart of Manufacturing"	Kenneth L. Block	Management Consultant, A. T. Kearney Co.	Hot Shoppe Restaurant	4
Indianapolis	"Aspects of Psychological Testing in Business and Industry"	Dr. E. R. Strain	Consultant	Marott Hotel	12
Kansas City	"Marketing—Heartbeat of Production"	Russell B. Robbins	Vice President, L. A. Young Spring and Wire Corp.	Elks Club	18
	Conference—Office Techniques and Practices				17, 18 & 19
Knoxville	"Work Measurement"	W. M. Aiken	Vice President, Methods Engineering Council, Management Consultants, Pittsburgh, Pa.	Deane Hill Country Club	11

TYPICAL S.A.M CHAPTER ACTIVITIES

FEBRUARY 1958

CHAPTER	SUBJECT	SPEAKER	TITLE	PLACE	DATE
Knoxville	"Research and Development of a Training Program"	W. R. Bryan	Manager of Conference and School Programs, Goodyear Tire and Rubber Co., Akron, Ohio	Deane Hill Country Club	21
Lancaster	"Measuring Management Efficiency—At All Levels"	John B. Joynt	Vice President, New York Central Railroad & Chairman of Board of Directors, S. A. M	Hotel Brunswick	18
Lehigh Valley	"Nine-Way Communication"	Dr. Francis F. Bradshaw	President, Richardson, Bellows, Henry & Co., New York	Walp's Restaurant, Allentown, Pa.	4
London & District	"Management & Electronics"	J. D. McKnight	Manager, I.B.M. Co., Ltd., London, Ontario	Hook's Restaurant	20
Milwaukee	"Executive—1958 Model"	J. Brown	President, J. I. Case Co., Racine	Ind. Eng. Bldg.	13
Montreal	"An Old Company Takes a Forward Look"	E. G. Burgess	Vice President, Planning & Development, Canadian Car Co., Ltd.	Ritz-Carlton Hotel	12
Nashville	"Group Incentives"	Serge Birn	President, Serge A. Birn Co., Inc., Louisville, Ky.	Hermitage Hotel	13
New Haven	"Creative Thinking"	Douglas Thomson	Supervisor of Employment & Training, U. S. Rubber Co., Naugatuck, Conn.	South Meriden House, Meriden, Conn.	20
North Alabama	Plant Tour			Chemstrand Corp.	12
Northeast. Pa.	"Evaluating Employee Benefits"	Edward Stringham	Conn. General Life Ins. Co., Wilkes-Barre, Penna.	Hotel Jermyn, Scranton, Penna.	3
Northern N. J.	"Work Sampling"	W. J. Richardson		Essex House	13
	Special Meeting "Short Cycle Standard Data"	H. Allan		Essex House	27
Pittsburgh	Annual All-Day Conference "Current Needs in Industrial Relations"	Lawrence A. Appley	President, American Management Assoc.	Webster Hall Hotel	6
Portland	"Newspaper Publishing" Meeting & Plant Visit	John Pihas	The Oregonian	Oregonian Bldg.	12
	"Labor Harmony"	William H. Way	AFL-CIO Portland Council Pres.	Public Service Bldg.	26
Poughkeepsie	Case Studies II			Nelson House	11
Providence	"Techniques of Work Simplification"	Harold Dunlap	Director of Work Simplification, H. P. Hood & Sons, Boston, Mass.	Brown Faculty Club	6
Raritan Valley	"Early Marriage; Its Significance for Education & for Management" Chapter Anniversary & Ladies Night	Dr. Mary I. Bunting		Pines Restaurant	19
Reading	"Group Participation to show The Value of Group Dynamics"	Hector E. MacDonald	Management Consultant	Iris Club, Wyomissing, Pa.	10
Richmond	"Profit Sharing"	Joseph B. Meier	Administrative Vice President, Council of Profit Sharing Industries	Holloway House	25
Twin City	"Legal Aspects of Long Range Planning"			Coffman Memorial Union, U. of M.	13
West. Mass.	"Problems of Establishing Standard Data"	Gilbert W. Rose	Senior Staff Engineer, Stevenson, Jordan & Harrison, N. Y., N. Y.		19
West. N. C.	"The Administration of the Office of Attorney General"	Herbert Brownell	U. S. Attorney General	The Manor, Asheville, N. C.	19
Wilmington	"The Art of Leadership"	J. Frederick Weiese	Vice President, Lukens Steel Co.	Lord de la Warr Hotel	11
Worcester	"Human Relations, a Management Tool"	Saul Silverstein	President, Rogers Corp.	Worcester Airport	17



New Management Writing . . .

A MANAGEMENT GUIDE TO ELECTRONIC COMPUTERS

By William D. Bell, McGraw-Hill Book Company, New York. 1957. $6.50

I APPROACHED another survey on electronic computers for management with skepticism—not expecting to find a significant contribution which hadn't already been made by several other books published in the past two years. After reading fifty pages my skepticism persisted, but at the finish I was convinced that the book will be useful.

A Management Guide to Electronic Computers is addressed to the business man and the executive, to give, in the words of the author: "a simple, non-technical explanation of what an electronic computer is and what it will do; factual information about the present state of electronic business systems; a realistic look at the future of electronic data-processing systems; and, finally, concrete suggestions to guide a company interested in acquiring its own electronic equipment."

Although the author, in his attempt to simplify, is at times embarrassingly chatty, he does succeed in his efforts at simplification. He has omitted or carefully explained technical jargon. Charts and illustrations are used liberally. Lists of advantages and disadvantages of alternative equipment, media or methods should be very helpful to the businessman who is drawn into the issues of office automation and must try to develop some discrimination among alternatives.

Nearly one hundred pages are devoted to case examples of electronic data processing in eleven companies including a variety of applications. The brevity of the case descriptions limits their usefulness. However, by study of all of them the reader will recognize that computers can be used for more than payroll, and that there are problems as well as opportunities. The author has packed a lot of experience into the cases.

A refreshing and challenging feature is a look ten years into the future. It is presented as an interview with the President of the Futura Company who demonstrates that he listened to his OR team and achieved IDP. This road toward scientific decision-making is very difficult, but Bell gives us insight into the rewards for those who pursue the goal with courage and persistence. The author points out that the use of electronic systems for on-line or real-time data processing requires a major change in our thinking.

I was also happy to find a word of dissent from the far-too-prevalent acceptance of decentralization as intrinsically good. On this subject, Bell says: "Actually, decentralization will, in many cases, represent a backward step, and this retrogression is made necessary for only one reason. Centralized operations have failed in practical operation because of inadequate data processing and communication within the organization. An electronic computer will completely change this situation."

Lowell H. Hattery
Professor of Government and Public Administration
The American University
Washington, D. C.

BETTER WAGE INCENTIVES

By Phil Carroll. McGraw-Hill Book Company, Inc. 1957. 230 pp. $4.75

IT IS a thin fiction that critics in the field of letters have a responsibility to present objective appraisals in their reports to the public. Actually, most reviewers have strong personal prejudices which they make little attempt to conceal. This does not matter greatly in the case of strictly literary works, and may even be an advantage, but for technical books objectivity in criticism is something to which the prospective reader is entitled. However, in the present instance, and with no sense of apology, this reviewer freely admits to a strong bias in favour of the author and of his work—bias that developed quite early in a 20-year acquaintanceship with Mr. Carroll's wide knowledge and unequivocal approach as expressed in his several books.

Better Wage Incentives is quite capable of standing by itself, but it takes on considerably more meaning and more value when read in company with Mr. Carroll's other books. His first, *Timestudy for Cost Control*, appeared in 1938 and was a landmark in the growing literature of timestudy. Having gone through several editions, it presumably has enjoyed the sale it deserves. It marked its author as a man of unusual awareness, integrity and technical skill in a calling in which these qualities have not always been conspicuous. If there has been an improvement in this respect—and most certainly there has—much of the credit must go to Mr. Carroll.

Mr. Carroll's style, originally a little heavy and not over lucid (especially for those not overly familiar with the subject) has gradually become light and idiomatic. Consequently it is somewhat disarming and the new reader may at first not realize that the rather staccato and colloquial approach tends to conceal the solid nature of the substance.

In this as in the author's *How to Control Production Costs* there is a wealth of sound and practical commentary and advice. It is well to note that the light style might lead to the supposition that Mr. Carroll is a somewhat superficial lay commentator rather than the technical expert that he is. A glance at his book, *How To Chart Timestudy Data* will reveal his mathematical and technical competence.

The book here reviewed deals with the preparation for, the structure of, and the administration of Wage Incentives based always on sound and careful timestudy. It commences with a discussion of the grievances that arise from the application of incentives and thus leads into consideration of the errors that give rise to such grievances. From there it naturally deals with the human and technical aspects of avoiding and correcting such errors. There is sound advice and shrewd observation on the methods of setting standards, the maintenance of valid standards, the establishment and operation of a sound incentive plan. There are chapters on the problems of methods change in relation to incentive pay, and on the position and responsibility of the foreman. There is a useful section on the preparation for arbitration of disputes over workloads and standards. The concluding chapter, continuing in a practical vein, discusses the fundamental need for sound work-standards in an economy threatened by inflation and carrying a phenomenal debt. There are numerous illustrations of the semi-humorous cartoon type as well as many simple graphs and charts.

The newcomer will find the book useful and perhaps more stimulating than if it had merely provided a blueprint for technique. The old-timer will enjoy seeing his opinions confirmed or challenged, and will take heart at the strong re-affirmation of the sound principles and concepts that Mr. Carroll has so consistently and stanchly upheld in a long career devoted to the support of moral and technical integrity in the crucial field of work-standards. The book is timely and is particularly welcome because of the remarkable scantiness of the literature in this key area of industrial engineering, industrial relations and industrial administration.

Ralph Presgrave
Vice President
J. D. Woods & Gordon, Ltd.,
Toronto, Canada

ANALYSIS FOR PRODUCTION MANAGEMENT

By E. H. Bowman and R. B. Fetter. Published by Richard D. Irwin Company. 1957. $7.80

BOWMAN, FETTER, and I are all members of the production group of the School of Industrial Management at Massachusetts Institute of Technology. We have all taught this material in each of three or more drafts. I have had every opportunity to criticize the manuscript in each draft, and my help is acknowledged in the preface. I am probably more thoroughly familiar with this book, and perhaps more prejudiced, than most readers will be for some time. I am probably not as qualified to judge the contents as many readers with stronger mathematical backgrounds. Others who have taught or read the book may have made more profound criticisms and contributions to the authors. My help was largely negative and somewhat superficial ("This is awkwardly phrased." "I don't understand this." "Please spell this out in greater detail.")

Having thus qualified, or disqualified, myself as reviewer, I will say that this is a good and much needed book. While neither students nor teachers nor managers will find it an easy book, all should find the game worth the effort. The text is, for the most part, lucid. Spots are overcondensed and tougher than they need be, and there are more trivial and typographical errors than are excusable. The problems and cases are good, illustrate a large

variety of applications, and are well presented. I am sure some teachers, including this one, will find the answer book a comfort when it becomes available—probably before this review appears.

The mathematical analysis of problems of production management seems too promising an approach to be neglected by managers or by teachers of management. Both, and students as well, will find challenging and helpful presentations of Mathematical Programming, Statistical Analysis, and Economic Analysis in the Bowman and Fetter book. These major sections are divided into chapters containing material on linear programming, dynamic programming, statistical control, sampling, industrial experimentation, total and incremental economic analysis, waiting line theory, Monte Carlo and investment analysis. These tools are applied to the analysis of problems of product mix, product composition, production scheduling, machine loading, matching requirements and capacities for greatest profit, quality control, analyzing causes of production troubles by experiment, lot size to manufacture or to purchase, reorder levels, scale of operations, planning allowances for rejects, determining optimum service facilities (e.g., number of cranes, maintenance men, operators for a group of automatic machines), and replacement and selection of equipment. This is a great deal to put into one book and the authors sometimes make the mistake of overcondensing.

None of these problems are approached as "cases" to be debated by students or resolved by intuition based on long experience. Rather, they are presented as engineering problems with parameters to be determined and solutions to be calculated. This point of view is perhaps the major contribution of the book, and the brightest hope for improving management. Perhaps we can greatly enlarge the area which yields to analysis wherein all reasonable men must agree, and decrease the area of judgment in which radically different views can be proposed and defended without end. The authors repeatedly stress the primary importance of this point of view, and yet readers may easily become preoccupied with the machinery of the techniques.

The analytical approach is not without its difficulties. Bowman and Fetter expect students to have had one course each in calculus, statistics, and economic theory. However, readers can get considerable from the book even if densely ignorant of all three. Certainly such readers cannot solve the problems presented! And there will be much in the text beyond their grasp. However, students and managers without the presumed background should be able to get some idea from this book of the kind and power of the approaches used. A persevering manager should learn much about the kinds of problems most likely to yield to a mathematical approach, and much about what to ask of his engineers and staff statisticians. He should be better prepared to follow vaguely what they do and to understand their conclusions. However, all readers, sophisticated and unsophisticated, should also have some idea of the limitations and difficulties of the mathematical approach, and Bowman and Fetter are of less help here.

The major difficulty lies, perhaps, in getting numbers to substitute for the symbols of the equations. Since managements deal with economic problems, economists are best equipped to handle the theoretical problems of data gathering, and their concepts of incremental revenues and costs and of opportunity costs fit the data implications of the mathematical approach very well indeed. However, economists seldom supply data about the internals of a firm. Instead, managements get data, which superficially seem to fit, from accountants, cost departments, time study men, and engineers. These data seldom reflect the critical roles of alternative opportunities, nor are they adapted to the techniques of balancing values of marginal increments. Bowman and Fetter give the reader little help here. In their problems, they provide the student with the necessary figures without indicating how such figures can be made available. Of course, they have deliberately limited themselves to an exposition of the analytical techniques, but I believe this an unfortunate self-restriction.

Considering the prerequisites expected of the student, this book has already been widely adopted as a text. It is likely to go through a number of editions. I hope the trivial and typographical errors will be corrected in early reprintings and that in subsequent editions the authors will take enough additional space to make difficult passages easier, to include other types of experimental inferences, and to make some sort of a start on the data problem.

Billy E. Goetz
Professor of Industrial Management
School of Industrial Management
Cambridge, Mass.

UNIVERSITY CHAPTER PERFORMANCE AWARDS REPORT

as of December 1, 1957

Indiana Univ.	1570	Case Institute of Technology	1040
LaSalle College —Eve. Div.	1570	Boston U.	1035
Ohio Univ.	1535	Ohio State U.	1010
U. of Conn.	1535	Rutgers U.	1010
American Univ.	1520	U. of Wisc.	1010
Boston College	1520	U. of Miss.	975
U. of Pitt.	1495	U. of South. California	975
Babson Inst.	1450	Tennessee Polytechnic Inst.	930
U. of Houston	1390	U. of Cinn.	930
U. of Kansas	1375	Xavier U.	895
Pennsylvania Military Col.	1350	Duquesne U.	890
U. of Texas	1350	Wayne State University	860
Rider College	1335	Guilford Col.	845
U. of California-Berkeley	1295	U. of Alabama	845
Miami Univ.	1240	Memphis State University	835
Clarkson College of Techn'l'gy	1220	Louisiana State University	820
U. of Minn.	1220	DePaul U.	800
Franklin & Marshall College	1190	West. Michigan College	785
Syracuse U.	1175	Kansas State College	740
Rensselaer Polytechnic Inst.	1160	State College of Wash.	735
U. of Illinois	1155	Penn. State U.	710
U. of Detroit	1145	U. of Penn.	675
Alabama Polytechnic Inst.	1140	U. of Richmond	645
Los Angeles State College (Ramona)	1110	Clemson Col.	600
Loyola U. of Chicago	1110	San Diego State College	600
U. of Cal.-L. A.	1100	Georgetown U.	595
U. of Missouri	1090	U. of Oklahoma	480
W. Virginia U.	1085	North Texas State Col.	430
St. John's U.	1070	Butler U.	315
Mississippi State College	1062	Seton Hall U.	315

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North Jersey manufacturer has opportunity for I. E. or M. E. with five years experience in methods, to supervise engineers in tool, machinery and welding methods development. Career opportunity with established company. Submit resume, including salary desired to Box 450-O

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Multi-plant, heavy machinery manufacturer in North Jersey, seeks M. E. with five years experience in steel fabrication and machine shop operations, ability to train and supervise foreman, thoroughly versed in all phases of production in heavy industry. Submit resume, includiing salary requirements to Box 451-O.

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